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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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1922

Theory and Practice of Partial Denture Service—*Cummer*

Some Interesting Facts Concerning the X-Ray—*Prothero*

Vitamin Deficiency Diseases—*Hatton*

Care of the Investing Structures of the Teeth—*Weaver*

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Annual Report of the Secretary—*King*

Report of Committee on Dental Nomenclature—*Anthony*

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WALDO E. BOARDMAN, D.M.D., Boston, Massachusetts
1851–1922

(Dr. Boardman died at Omaha, Nebraska, on his return trip from the Los Angeles Meeting.)

THE JOURNAL
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Original Communications

AN OUTLINE OF THE THEORY AND PRACTICE OF PARTIAL DENTURE SERVICE

By W. E. CUMMER, D.D.S., Toronto, Canada

(Read before the Chicago Dental Society, March 21, 1922)

EXPLANATORY NOTE

Partial denture service includes (a) theory, defined as "the classified knowledge of the subject" (Wilson) and (b) practice, the use of this classified knowledge in guiding the hands in the various handicraft-operations necessary in the replacement of lost teeth.

The theory of partial denture service is made up chiefly of a working knowledge of the (a) natural structures and functions to be restored (gross and minute), including their probable behavior when subject to unusual stresses; (b) standardized parts, which when brought into proper juxtaposition, will result in an appliance which will (1) restore structures and functions as maybe by human agency and (2) prevent further injury to structures and functions; (c) prevention of injuries to these parts—(1) injuries which naturally result in the loss of teeth; (2) injuries from improperly designed and constructed artificial parts.

The Practice of Partial Denture Service. Having acquired, and mentally classified the foregoing theoretical principles, these may be used as a guide to correct manipulation in the Practice of Partial Denture Service. Practice is made up of four stages: Design, Construction, Installation and Maintenance.

Design.—A mental or graphic picture must precede all engineering construction. In Partial Denture design the theoretical principles are made use of as needed in the development of design. The main item of practical value of this demonstration is that of a mental and graphic technic for the development of any design for any combination of teeth in four simple stages.

Construction.—Having developed mentally or on paper the correct design, the next step is that of actual construction. Accuracy, lightness, small bulk as possible, rapidity, ease, and low cost are of primary importance. Much research and invention are needed here.

Installation.—Many a fine piece of well designed and constructed prosthetic work has become a failure for the sole reason of lack of care in installation. Hence the importance of this step.

Maintenance and repair.—Many a piece of well designed, constructed and installed prosthetic work becomes a failure because of im-

Chart # 1

PARTIAL DENTURE SERVICE

(continued) ROYAL COLLEGE DENTAL SURGEONS

THEORY OF PARTIAL DENTURE SERVICE :- A Working Knowledge of:-

A. RESTORATION

1. Structures to be restored
   1. Teeth
   2. Associate parts.
2. Functions to be restored
   1. 1st step in digestion ..... 1. Mastication, 2. Insalivation, 3. Deglutition.
   2. Speech & Voice
   3. Expression.

B. STANDARDIZED PARTS, WHICH, IN PROPER ASSEMBLY, WILL :-

3. Restore Structure and Function as may be by Human Agencies } Sec. Chap. No.
4. Prevent further injuries to Structure and Function as may be by Human Agencies }

C. PREVENTION

5. Injuries as result of extraction by good appliances preventable
   1. Drifting
   2. Exfoliation
   3. Excessive Stress & Wear
   4. Stagnation.

6. Injuries as result of Faulty appliances preventable by Good appliances. (Presupposing Healthy Mouth

STRUCTURES

1. Enamel, Dentine and Cementum :- intensive caries production, erosion and wear, from capillarity
2. Gingivae :- impingement and interference.
3. Mucosa and subjacent bone :- overload.
4. " " " " :- strangulation.
5. Pericementum and mucosa, with subjacent bone :- overload.
6. Pericementum :- overload.
7. " " :- torque, vertical.
8. " " :- torque, horizontal.
9. " " :- incline plane, (wedge) mesio-distal
10. " " :- incline plane, Bucco-lingual.
11. " " :- incline plane, M.D. B.L.
12. " " :- incline plane, axial.
13. " " :- lever 1st class (shears)
14. " " :- " 2nd " (nut cracker)
15. " " :- " 3rd " (Flask tongs)

(3 out of 5 M.A.)

16. Pericementum, combinations of all mechanical advantages.
17. Dental pulp and periapical tissues, various injuries.
18. Cheeks, tongue and soft tissues, impingement and irritation, leading possibly to malignancy.

FUNCTIONS.

19. Mastication and ultimate digestion, various injuries.
20. Speech and voice, lisping, thick speech and etc.
21. Hearing, interference with.

BOTH STRUCTURES AND FUNCTIONS.

22. Any or all of above injuries, from lack of systematic maintenance.

Fig. 1.—Duplicate of chart as shown. Note three divisions of theoretical knowledge—A, B, C, with detail.

proper maintenance and inattention to necessary repairs. The patient here divides the responsibility with the dentist. Hence also the importance of this step.

Theory

1. Restoration

It is manifestly impossible to attempt the restoration of structures and functions wholly and partially lost without an intimate knowledge of each of these, both gross and minute. The necessity of subjecting both the teeth and associate tissues to unusual stresses requires a knowledge of the probable behavior of these tissues under these stresses, in order to utilize these tissues as much as possible and avoid overload. Incidentally the dental profession requires a very considerable amount of data on this probable behavior of tissues under various loads, from research investigation not yet done.

2. Standardized Parts

In manufacturing practice, standardized products are assembled by the juxtaposition of standardized parts by manufacturing processes. This juxtaposition may be varied for special needs or uses; for example a variation in the juxtaposition of parts of an automobile will result in a variety in the product, with a proportion of the parts identical in each.

In partial denture design the process is a mental or mental-graphic one with a mental store house of six classes of standardized parts located in the mind of the dentist as a result of his theoretical studies. This forms the second branch of the theory of partial denture service as may be noted in detail in Figure 2.

3. Bases, Attachments, Teeth

The *base*, or that part in contact with the mucosa, includes the saddles and parts connecting saddles, discussed under Design, step 1 and 2. Vulcanite as a material is indicated in cases which may require rebasing, especially after recent extraction. The *attachment* here describes that element which joins the teeth to the base, usually vulcanite, occasionally gold (with tube teeth, crowns, or similar). The *teeth* used are usually vulcanite pin teeth, detachable facings, or tube teeth. The sulcus angle of these teeth should be made to correspond with that of the remaining teeth, and all of the detail of marginal and transverse ridges, grooves, etc., should be present to allow the escape of cut food and prevent overload.

4. Retention, and Objectives in Retention

All that is required in retention of any artificial restoration is fixation sufficient to oppose gravity or the displacing effect of mastication. Gravity in uppers is very slight, a matter of ounces, and the bulk of masticating force tends to seat the denture in position. Hence only a slight retentive force is necessary, except in small removable bridges, which may be swallowed, in which the retentive force should be positive, requiring some effort to remove.

Obviously the piece should be retained so far as possible at the center of gravity. In addition to this the following objectives may be noted:

(a) Use of simple retainer (as clasps) of smallest possible contact-area instead of compound retainers, (as Roach attachments, etc.) as far as possible for both preventive and economic reasons.

(b) An effort to use two only retainers with fulcrum line (imaginary line between direct retainers) passing through the center of gravity of restoration (Class 1-2-3) with or without indirect retainers (Fig. 3).

(c) The use of three or more direct retainers if (1) paired teeth may not be found opposite, with fulcrum line in center of gravity, or if (2) a splint-support for teeth of impaired pericementum is required.

5. Direct Retainers

Retainers are subdivided direct and indirect, direct retainers such as clasps and similar applying the retentive force directly at the point of application. As noted

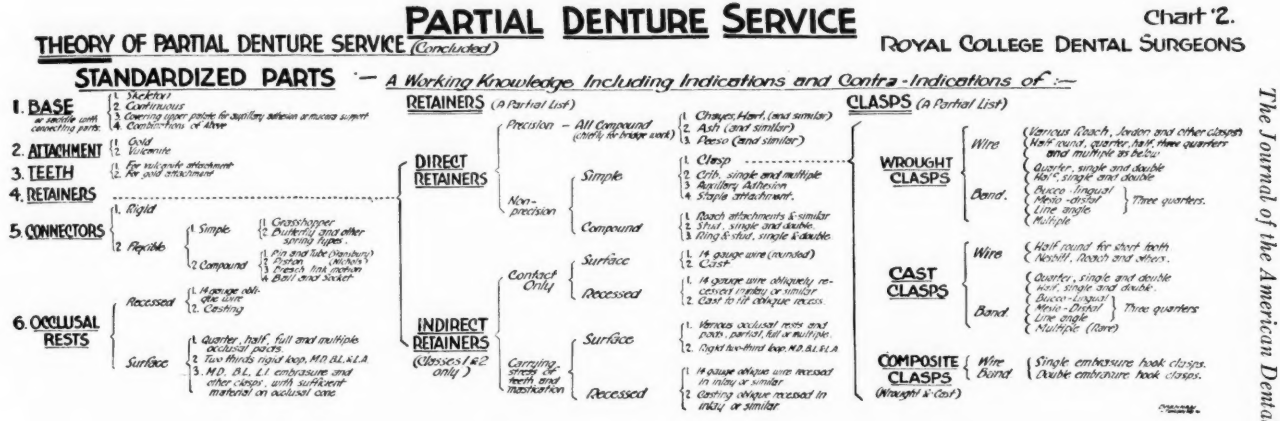

Fig. 2.—Chart of standardized parts as shown. A working knowledge of these having been acquired, their juxtaposition may be easily accomplished as noted in text, in four simple stages—

1. Saddles.
2. Parts connecting saddles
3. Retention.
4. Occlusal rests.

in Figure 2 these are *simple* (as clasps, cribs, etc.) and *compound* (as Roach, ring and stud, etc.). The simple retainers are preferable over compound retainers because no cutting of tooth tissue is necessary. Compound retainers are indicated when excavation of tooth tissue is either necessary or has been already done.

6. INDIRECT RETAINERS

Direct retainers should be ordinarily two in number and should be placed directly opposite with an imaginary line joining them (fulcrum line) passing through the center of gravity of the restoration. Frequently this is impossible because the fulcrum line joining the two teeth adjacent to the edentulous space may lie outside the center of gravity of the restoration. Hence an extension brought into contact with a suitable tooth remote from the unsupported part of the restoration will bring the fulcrum line to the center of the piece. These extensions are called indirect retainers as is noted in Figure 3.

7. CONNECTORS

In cases in which the pressure of mastication is either wholly carried by the teeth or roots or divided between these and the mucosa, a No. 14 gauge wire soldered to the clasp, or other retainers, placed usually in the embrasure (see Fig. 11), and attached by solder to the balance of the frame work may be used.

If, however, for such causes as flabby mucosa, few remaining teeth, or similar, it may be deemed unsafe to divide the pressure for fear of overload of the pericementum, non-rigid connectors may be used. Examples of two types are shown, rigid and non-rigid, Figures 4 and 5.

8. OCCLUSAL RESTS

Occlusal rests if used transmit all or part of the pressure of mastication to the teeth and pericementum upon which they may rest. These are of various types as noted (Fig. 2) for various purposes, as noted hereinafter.

9. PREVENTION OF DRIFTING, EXFOLIATION, EXCESSIVE STRESS, WEAR AND STAGNATION

These changes following the loss of teeth are usually preventable by the immediate insertion of well designed partial restorations, and are as follows: (1) drifting, limited or extensive, usually with and occasionally without traumatic occlusion; (2) exfoliation, limited or ex-

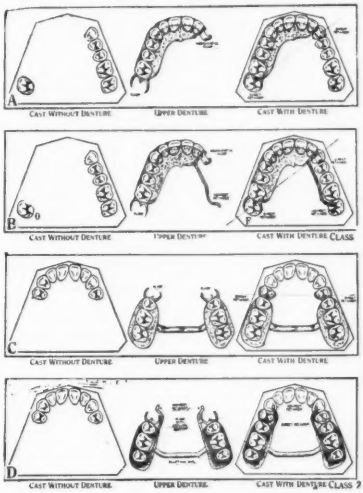

Fig. 3.—*Indirect Retention.* A. shows a restoration which would be unsuccessful because the fulcrum line lies to one side of the center of gravity of the piece, and the saddle in the cuspid region would be unstable. B. shows the restoration A. corrected by a No. 14 gauge extension reaching to the second molar at a horizontal point on the occlusal surface at which the articulation will admit. This brings the center of gravity coincident with the fulcrum line, and stablizes the unsupported part of the saddle (the cuspid region). The foregoing is an example of Class 1 with direct retainers diagonally opposite. C., a Class 2 restoration (with direct retainers diametrically opposite), unsuccessful because the fulcrum line lies outside the center of gravity. D. same as C., corrected by indirect retention bringing the center of gravity coincident with the fulcrum line. As noted in Fig. 5, indirect retainers are of various types, contact only, and also carrying teeth, restoring spaces, etc.

tensive, usually with or occasionally without traumatic occlusion; (3) excessive stress and consequent wear on remaining teeth; (4) stagnation of non-occluding teeth.

Reference of these to patients who are not inclined to accept proposed treatment is often of value.

10. LIST OF MOST FREQUENT CAUSES OF INJURY TO STRUCTURES, AND INTERFERENCE WITH FUNCTIONS AS COMMONLY FOUND IN PARTIAL DENTURE DESIGN AND CONSTRUCTION, INSERTION, AND MAINTENANCE (IN PART)

Here follows a list in part as enlarged from twenty-two items, Figure 1, No. 6 (injuries as the result of faulty appliances), with most frequent examples of each. It may be noted that, capillarity, impingement, interference, and the three out of the five mechanical advantages (torques, levers and incline planes) include all of these destructive forces.

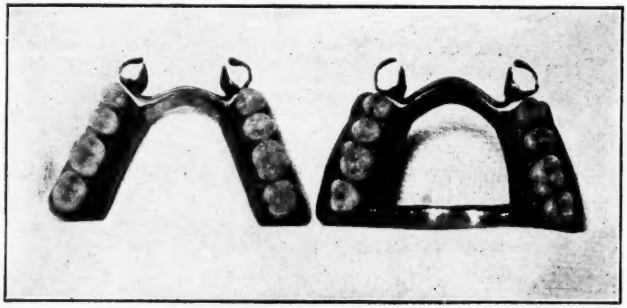

Fig. 4.—A simple non-rigid connector of No. 18 gauge elastic wire. An independent saddle movement is here secured, but without support from adjacent teeth.

STRUCTURES

11. ENAMEL, DENTIN AND CEMENTUM, INTENSIVE CARIES PRODUCTION, EROSION AND WEAR

(a) Capillary retention against enamel (faulty or at fissures) from clasps,

Fig. 5.—A compound non-rigid connector. Mr. Dresch has stated that, by the use of vulcanized rubber between the links pressure may be divided between teeth and mucosa. (Models furnished through the kindness Dr. L. F. Furnas, Cleveland, Ohio).

occlusal rest, or pads causing intensive caries production.

(b) Capillary retention against dentin by clasp, pad, or other constructional parts, causing intensive caries production.

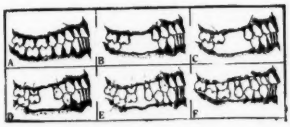

Fig. 6.—*An instance of progressive drifting and exfoliation* following extraction with increase of traumatic occlusion. (a) before extraction; (b) immediately after extraction, no traumatic occlusion; (c) lower molar tipping forward and separating both upper and lower, bicuspid driving upper bicuspid distally; (d) the same condition only considerably worse, with exfoliation; (e) and (f) the same with separation of upper anterior. At any stage these progressive conditions could have been checked by well designed partial restorations.

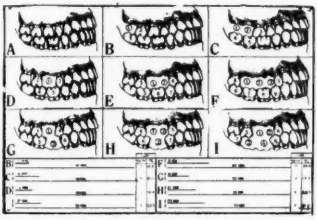

Fig. 7.—*Excessive stress and consequent wear.* The approximate losses in area, hence masticating efficiency is indicated above. (a) complete denture; (b) one tooth at the end of a series, loss approximately 12.2 per cent; (c) two teeth, loss approximately 21.1 per cent; (d) one tooth in center of a series, loss approximately 23.3 per cent; (e) two teeth, loss approximately 23.3 per cent; (f) three teeth, loss approximately 34.4 per cent; (g) two teeth, loss approximately 17.7 per cent; (h) three teeth, loss approximately 23.3 per cent; (i) four teeth, loss approximately 31.1 per cent. In each case these losses indicate the same stress heretofore carried by the complete denture and now assumed by the remaining teeth. It might also be noted that, when a tooth is extracted from the center of a series, the function of five others is interfered with as in (d), the function of Nos. 2-3-4-5 is interfered with, with complete loss of function of the extracted tooth No. 1.

(c) Capillary retention against cementum by clasps, base, or other constructional parts, causing intensive caries production.

(d) Clasps and other parts over inlay margin, causing intensive caries production.

(e) Clasps and other parts over eroded areas, causing further erosion, caries or both.

(f) Abrasion, usually from porcelain in overload relation to abraded teeth.

(g) Attrition, usually from natural teeth in overload.

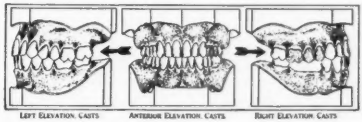

Fig. 8.—A sample of stagnation, with nature's toothbrush (e.g., the passage of food over teeth driven by teeth and occlusion) absent. Especially with a lack of salivary balance, the above is apt to occur. Note difference in left and right elevation of cast.

(h) Use of compound retainers rather than simple, resulting in unnecessary destruction of tooth tissue.

(i) Unnecessary number and contact area of direct retainers.

12. GINGIVAE, IMPINGEMENT AND INTERFERENCE

(a) Impingement against gingival margin, or septal gingivae by casps, etc.

(b) Impingement against gingival margin, or septal gingivae by saddle and other constructional parts.

(c) Impingement against gingival margin, or septal gingivae by "settling" clasps and saddles, especially after recent extraction.

(d) Interference from unprotected gingival margin and septal gingivae from lack of *occlusal* protective contours, such as marginal ridges, cusps, etc.

(e) Interference from unprotected gingival margin, and from septal gingivae from lack of *axial* protective contours.

13. MUCOSA AND SUBJACENT BONE, OVERLOAD

(a) Overload from small saddle area in proportion to mastication area, and pressure, without occlusal rests.

(b) Local overload, improper muscle trimming, saddle outline, etc.

(c) Local overload from incorrect forecast of compensation for hard areas, and settling.

(d) Overload of mucosa from relation of direct retainer and mucosa with too much pressure on mucosa.

14. MUCOSA AND SUBJACENT BONE, STRANGULATION

(a) Parallel wrought and cast clasps, connectors, and compound retainers which do not release after pressure applied from too tight construction, etc.

(b) Clasps with excess toward gingival cone.

(c) Indirect retainers adjusted too tight.

(d) Overloads on mucosa as above.

(e) Relations between saddles and direct retainers giving mucosa too much pressure.

15. PERICEMENTUM AND MUCOSA, WITH SUBJACENT BONE, OVERLOAD

(a) Local overload, from warpage in construction and too great pressure at one or more points.

(b) Overload, from lack of escape groves, with flat cutting contacts rather than line contacts.

(c) Overload from all constructional parts preventing exact central occlusion.

16. PERICEMENTUM, OVERLOAD

(a) Overload from occlusal rests, from expected absorption (especially after recent extraction) with no rebasing.

(b) Overload from large saddle area, on each side of remaining tooth or teeth, with occlusal rests.

(c) Overload from medium saddle-area, soft mucosa, with occlusal rests.

(d) Clasps without occlusal rests too heavy to admit of vertical "slip" especially with soft mucosa.

17. PERICEMENTUM TORQUE, VERTICAL

(a) Cast clasps too wide on free saddle.

(b) Cast clasps too thick on free saddle.

(c) Cast clasps (b.l.) wide body on free saddle.

(d) Cast clasps (m.d.) too wide at free ends and attached to free saddle.

(e) Cast clasps (b.l.) too thick at free ends and attached to free saddle.

(f) Cast clasps (l.a.) attached to free saddles as above.

(g) Reinforced wrought clasp attached to free saddle as above.

(h) Improper relief on all clasps (e.g. right angles to fulcrum line).

18. PERICEMENTUM, TORQUE, HORIZONTAL

(a) Cast clasps on single teeth.

19. PERICEMENTUM INCLINE PLANE, (WEDGE) MESIO-DISTAL

(a) Interfering embrasure hooks above contact point.

(b) Connectors improperly soldered to free end of clasps.

(c) Too much solder, connector to clasp.

(d) Occlusal rest too short and on incline plane.

(e) Improperly placed rigid connectors on leaning teeth.

(f) Improperly placed clasp bodies on leaning teeth.

(g) Rigid 2-3 loops too short.

20. PERICEMENTUM, INCLINE PLANES, BUCCO-LINGUAL

(a) Indirect retainers on incline planes without occlusal rests on direct retainers.

(b) Improperly placed rigid connectors on leaning teeth.

(c) Improperly placed clasp bodies on leaning teeth.

(d) Skeleton work too rigid.

21. PERICEMENTUM, INCLINE PLANE, M.D.B.L.

(a) Teeth interfering with occlusion.

(b) Teeth interfering with articulation.

(c) Parts interfering with occlusion.

(d) Parts interfering with articulation.

(e) Shrinkage and distortion of metallic frame-work.

(f) Contours too full, inlays, crowns, etc.

22. PERICEMENTUM, INCLINE PLANE, AXIAL

(a) Clasp above or below line of widest cross-section.

(b) Rebound of displaced mucosa, with relation of direct retainers and mucosa too close without occlusal rests.

23. PERICEMENTUM, LEVER FIRST CLASS (P. F. W., EX-SHEARS)

(a) Indirect retainers too tightly adjusted.

(b) Cast multiple clasps on single groups of teeth.

(c) Indirect retainer too close to fulcrum line.

(d) Teeth set outside ridge.

(e) Certain Class III cases with free saddle on soft mucosa.

24. PERICEMENTUM, LEVER SECOND CLASS (P. W. F., EX-NUT CRACKER)

(a) Cast multiple clasps on single groups of teeth.

25. PERICEMENTUM, LEVER THIRD CLASS (F. P. W., EX-TWEEZERS)

Indirect retainers, no occlusal rest on direct retainer. (Remainder of mechanical advantages, i.e. screw and pulley, not found.)

26. PERICEMENTUM, COMBINATIONS OF ANY OR ALL MECHANICAL ADVANTAGES

(a) Cast clasps with rigid connectors on flabby mucosa, without provision for correlation of movement of saddle and anchor tooth.

27. THE DENTAL PULP, PERIAPICAL TISSUES, VARIOUS INJURIES

Because of the interdependence of the dental pulp, pericementum, dentin, enamel, cementum and gingival tissues, injuries to the dental pulp, followed by diseases of the dental pulp with sequelae, may occur from any or all of the foregoing causes.

28. CHEEKS, TONGUE AND SOFT TISSUE, IMPINGEMENT AND IRRITATION, LEADING POSSIBLY TO MALIGNANCY

(a) Improper overhang to prevent tongue and cheeks biting.

(b) Positioning of constructional parts not close enough to prevent irritation to tongue and cheeks.

(c) Improper finishing, rounding off of sharp edges, elimination of feather edges, etc. (should include a study of the microscopy of the polished and aseptic surfaces).

FUNCTION

Injuries may result from lack of application of all known principles, especially in:

29. MASTICATION AND ULTIMATE DIGESTION, ETC., VARIOUS INJURIES

(a) All missing teeth and surfaces not supplied (for example with special occlusal pads to secure greatest masticating surface).

(b) Lack of anatomical articulation on partials (various mechanical advantages as before mentioned).

(c) Lack of positive retention in small pieces and danger of swallowing of piece.

30. SPEECH AND VOICE, LISPING, THICK SPEECH, ETC.

(a) Parts crossing ahead of bicuspids to be between rugae or failing this, wide flat cast or swage pieces (avoiding lisping, etc.).

(b) Parts crossing distal to first molar, bar or similar not crossing approximately opposite to the second molar, causing thickening of speech.

(c) Parts not close to mucosa (causing both lisping and indistinct enunciation).

Chart "3.
PARTIAL DENTURE SERVICE
ROYAL COLLEGE DENTAL SURGEONS
PRACTICE OF PARTIAL DENTURE SERVICE :- Choice and execution of :-
(Presupposing Mastery of Theory and of Necessary Handicraft and with mouth "made ready")
PRELIMINARY
1. General Examination (If required, by Physician)
2. Dental Examination
1. Charts
2. Study Models
3. Both or neither
4. Order of Examination (With or without radiographs)
1. DESIGN
1. Saddles (Allocation Load to Mucosa)
1. Skeleton
2. Continuous
3. Upper Palatal
4. Combination of Above
2. Parts connecting saddles
1. Cast
2. Wire or plate, wrought
3. Wire, pure gold, solder built up.
4. Combinations of the above
3. Direct and Indirect Retention and Connectors
1. Class 1. - D & I.R. × (2 D)
2. " 2. - D & I.R. = (2 D)
3. " 3. - D.R. ∩ (3 D)
4. " 4. - D.R. △ △ (3 + D)
4. Occlusal Rests (Allocation of load to teeth and their pericementa)
1. Recessed
2. Surface, including, Partial, Full and Multiple occlusal rests and pads, and rests for Occlusal Cone
2. CONSTRUCTION (PRECISION)
1. Direct retainers and Occlusal rests completed, checked for interference, and in mouth.
2. Impression Preferably Muscle-trimmed
1. All plaster
2. Plaster, sectional method.
3. Plaster and compound, sectional method.
4. Dr. Furnas' Method.
3. Cast
1. Stone, with wax reliefs for undercut parts, Indirect assembly.
2. Investment, Material for direct assembly.
4. Assembly (with all metal parts joined e.g. solder) (Determine sequence in Insertion;) one, two or three directions
1. Indirect, off cast
2. Direct, on cast (with loss of cast)
5. Checking above in mouth (spot grinding if necessary)
1. Vulcanite with temporary wax base
2. Metal, as to be finished.
6. Anterior Teeth :- applied Esthetics
7. Posterior Teeth :- Articulation and Occlusion.
8. Checking in mouth, in wax mount.
9. Finishing.
3. INSERTION OR INSTALLATION
1. Before piece snaps "home." ..... Carbon paper and spot-grinding
2. After piece snaps "home" (final allocation of load) ..... Carbon paper and spot-grinding
Teach patient and have patient practice insertion and removal before leaving
3. Subsequent Adjustment and Rebasing at subsequent sittings, till load is properly distributed.
4 MAINTENANCE (The Patients Part)
1. General Oral Health :- Diet, exercise; Elimination, Immunity etc
2. Saliva flush & Cleansing 5 times per day
3. Removal night
4. Notification
5. Repairs (Prompt) (a) fractures & simple replacements (b) Additions for teeth lost (c) Other repairs
6. Literature for patients catering above.

Fig. 9.—Chart on Partial Denture Service as shown. Note four stages, with detail as subsequently described.

31. INTERFERENCE WITH HEARING

(a) Neglect of sufficient intermaxillary distance in restoration (may interfere with opening of meatus by condyle tipping back and causing obstruction).

BOTH STRUCTURE AND FUNCTION

Almost all of the foregoing injuries to structure and function may occur, or may be aggravated through breakage, settling, or other contingencies difficult or impossible to forsee. *After* insertion these may be prevented by proper inspection and maintenance including the following:

32. MAINTENANCE (THE PATIENT'S PART)

(a) Cleansing five times per day.

(b) Saliva flush.

(c) Removal at night.

(d) Use of notification system for periodic examination furnished by dentist.

(e) Prompt repairs if necessary.

(f) Study of suitable literature provided by dentist.

PRACTICE OF PARTIAL DENTURE SERVICE

33. SUBJECT MATTER, GENERAL

The practice of partial denture service consists of:

(a) Examination of the semi-edentulous patient for discovery of the details which have bearing on the case.

(b) The notation of the injuries consequent on extraction to be prevented or avoided.

(c) The most favorable juxtaposition of standardized parts with which to accomplish this purpose.

After the preliminary examination, follows the practical application of the theory previously acquired to the special condition found in the mouth of the semi-edentulous patient. This detail may be best redistributed in an engineering sequence as follows: (a) design, (b) construction, (c) installation or insertion, (d) maintenance and repair.

(d) The subsequent phases of construction, installation, and maintenance, in which details of prevention constantly recur.

34. PRELIMINARY EXAMINATION

This may be done in part, or, if consultation with specialist difficult or impossible, in whole by the attending dentist. The interdependence of other branches of dentistry may be noted here, and a suggested sequence follows:

History.—Questioning of patient as to any pathological condition outside of mouth; if apparently present reference to physician for examination.

Objective symptoms.—General dental examination for all dental disease, which may or may not give rise to systemic disease as above, with or without radiographs. If obscure, preferably by expert dental diagnostician.

Subjective symptoms.—Particular dental examination, and consultation with, and treatment from, if necessary: (a) Preventologist: Various items as elimination of predisposition to dental disease, etc. No restoration may be begun with any assurance of success while predisposition to dental disease exists in the mouth. (b) Peridontist: Various items, as probable condition of pericementum under stress, relief from overload, disposition of stresses, etc. (c) Orthodontist: Various items, as preference of orthodontic treatment, over prosthetic, comcombined orthodontic and prosthetic treatment, inclusion of orthodontic appliances as retainers in prosthetic appliances, etc. (d) Oral Surgeon: Various items, as preference of surgical treatment over prosthetic, combined surgical and prosthetic treatment. etc. (e) Exodontist: Character of mucosa support which will probably follow extraction and possible alveolectomy to improve these. Indications of alveolectomy with prosthetic restorations for aesthetics, etc. (f) Any or all of above.

In all cases certain preliminaries, as charts, models, etc., may be necessary, previous to special examination for pros-

thetic work. Here follows a list indicating the use or non-use of these:

1. None. Simple cases evident on inspection.
2. Charts only. Simple cases not evident on inspection.
3. Charts and study models. More difficult cases not evident on inspection, with marked variations from normal of condition and position of teeth not readily noted on charts. (Variations on a horizontal plane only.)
4. Upper and lower study models. Ditto with marked variations of position of teeth between upper and lower jaws. (Variations on a vertical and horizontal plane.)
5. Upper and lower study models mounted on articulator from bite blocks—ditto when sufficient facets are not present for securing the occlusal position.

Here follows a special dental examination for denture design and specification in which various items are noted for further use in design and specifications, construction, installation, and maintenance.

1. Number and location of remaining teeth and spaces. Note these on chart, No. 1, design.
2. Condition of remaining teeth.
3. Condition of mouth and mucous membrane.
4. Condition of alveolar border, extent of absorption, location of muscular attachments and frena.
5. Condition, location and extent, hard and soft areas.
6. Relation of upper and lower ridge.
7. Condition of saliva.

35. DESIGN AND ITS DEFINITION

A design of a partial restoration is a (a) mental picture or, (b) mento-graphic supplemented by drawing of the proposed restoration which should be, as far as possible, completed before any material is collected or work begun.

The mental process in design involves: (a) a mental storehouse of the pictures of the standardized parts from which all partial dentures may be constructed, acquired from theoretical studies, as already noted; (b) a knowledge as to their correct use i.e. greatest functional efficiency and least destructive tendency upon natural teeth also acquired from the theoretical studies; (c) examination for discovery or conditions peculiar to case; (d) the knowledge of a simple working procedure in securing above-mentioned mental or graphic pictures, suitable for case in hand.

The foregoing being complete, the actual four steps in design may then be begun.

36. STEPS IN DESIGN

My hypothesis is that dentists and students may best learn to design all partial dentures above a certain grade of difficulty by a graphic method (involving the use of a rubber stamp or printed chart of fourteen teeth) in *four definite and distinct steps* in which the above-mentioned preventive considerations continually recur in redistributed order.

1. Saddles.
2. (0) Parts connecting saddles.
3. (4) Direct and indirect retention and connectors. (At this stage the case is classified.)
4. (3) Occlusal rests if indicated (this order subject to variations).

For simple cases both charts and models may be omitted. While in complex cases especially those in which the bite must be lenthened, both charts, study models articulated and the presence of the patients are sometimes required in order to develop a design.

37. SADDLES DESIGN

Allocation of load to mucosa.—In the design of saddles, the mucosa is given its share of the load. The softer the mucosa the larger should be the saddle. A slightly intermittent pressure is more favorable, and a steady pressure in excess compresses the circulation, causes a so-called "strangulation" with absorption similar to too great peripheral valve seal on full dentures.

In outline the saddles should be kept away from the gingival margin. With regard to saddle-area, Dr. Chayes's statement of "saddles area must equal combined pericemental areas of teeth missing and supplied" probably approaches close to the solution (*Items of Interest,* November, 1915). Professional knowledge regarding this fundamental exists almost entirely from professional experience, more or less definite. Until research on proper loading of mucosa, proper loading of the teeth and correlation of saddles and tooth movement is done, partial den-

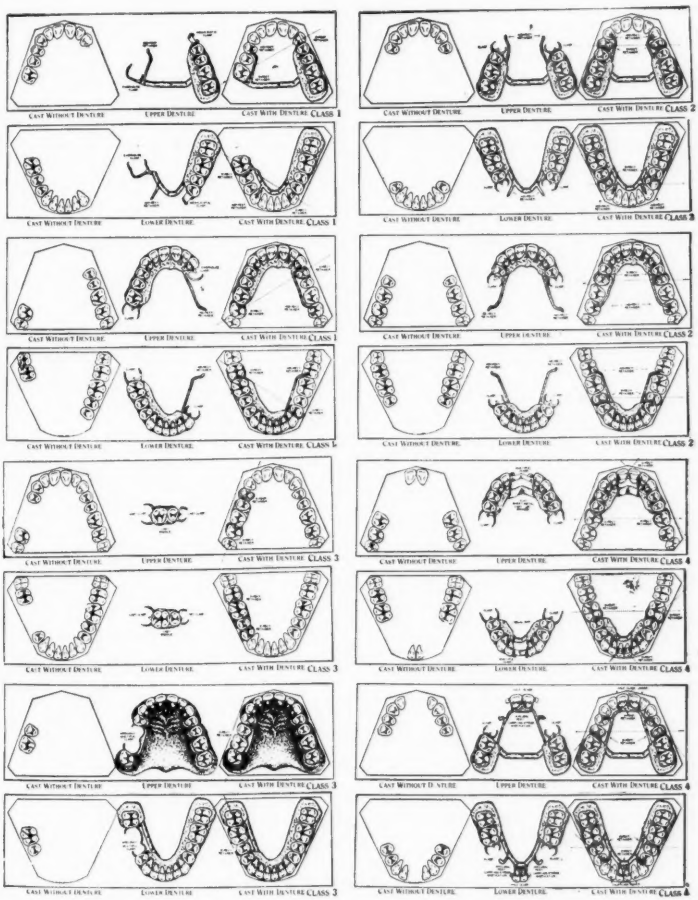

Fig. 10.—*In step No. 3 in design the case becomes classified.* Representative cases (with inversion) of each of the four classes. (1) Class 1 cases *with direct retainers diagonally opposite,* direct and indirect retention; (2) Class 2 cases *with direct retainers diametrically opposite,* direct and indirect retention; (3) Class 3 cases with *direct retention on one side,* direct retention only; (4) Class 4 cases with *three or more direct retainers in a semi-triangular, or semi-quadrilateral relationship,* direct retention only.

tures will continue to wreck teeth. In the opinion of the writer the subject is so lacking in accurate data that a series of factors to be weighed in the choice of support (mucosa, root, or combination is all that is available) (Fig. 12). Below follows steps in saddle design:

Upper and Lower

1. Buccal periphery, posterior, to be carried to peripheral valve seal.
2. Buccal and labial periphery, anterior, as above unless no artificial gum is desired.
3. About teeth, 1 to 2 mm. space to avoid capillarity.
4. Lingual periphery as determined by area of mucosa support desired and in the next step (parts connecting saddles).

38. PARTS CONNECTING SADDLES

These (when required) are almost always located to the lingual of the teeth, occasionally buccal and labial, and may be developed as below. The choice between a partial denture or two or more pieces of bridge-work often arises here.

Upper and Lower

1. If alternate space and tooth or similar use continuous construction.
2. If alternate space and group of teeth, or similar, use skeleton construction.

Upper

3. If parts required to cross anterior, flat or semi-round, cast or wrought, and placed in a suitable depression between rugae. If this is not possible, flat wide piece.
4. If parts required to cross posterior, between first and second molar, cast or wrought, flat or semi-round, depending upon grade, and compensated for differences between hard and soft areas.
5. Choice between anterior, posterior, or both. This depending on strength of appliance required, range, available space, occupation and choice of patient, and other factors.

If Soft Mucosa, Upper

6. All saddles should be extended to cover mucosa on working side of fulcrum line over entire vault.

Lower

7. All parts connecting lower saddles, lingual bar, low as muscle attachment will permit, and 1 or 2 mm. lingual from soft tissues.

39. POSITION AND CHOICE, RETAINING DEVICES (AT WHICH STEP THE CASE BECOMES CLASSIFIED)

Under this head the clasp of smallest dimension consistent with efficiency to reduce capillarity is preferred, if possible two only in number (Classes 1, 2, 3). Cast clasps should not be used in locations causing torques. I note with pleasure the increasing popularity of clasps of narrower contacts from the writings of others. A suggested detail for the positioning and choice of retainers follows:

1. With small straight edge to hand, choose paired (Classes 1, 2, 3) or triplet (Class 4) in the following steps:

(a) Lay straight edge across opposite pairs of natural teeth adjacent to edentulous spaces, so as to allow the straight edge to pass across the center of area of figures outlined in steps 1 and 2 (usually omitting central, lateral and third molars). Classes 1 and 2. This being inexpedient

(b) Lay straight edge across opposite pairs of natural teeth adjacent to edentulous spaces, so as to allow the straight edge to pass across the center of area of the entire arch, (Classes 1 and 2). Add indirect retainers usually omitting the use of central and lateral upper and lower. This brings the fulcrum line in center of area of the piece.

(c) Lay straight edge on pairs of teeth in line on one side of figure developed in steps 1 and 2, which may afford retention, with or without auxilliary adhesion (Class 3). This being inexpedient

(d) Lay straight edge on three teeth (or if necessary four teeth) in a semi-

triangular or semi-quadrilateral relationship (Class 4).

2. Select from (1) the most favorable paired group, or if not possible, (2) the triplet or quadruplicate group of teeth most suitable for clasps.

(a) Teeth with decided opposing convexities, (M.D.-B.L.-L.I.X2).

(b) Teeth of good pericemental and enamel condition.

(c) Teeth with freedom from caries, erosion, abrasion, large fillings, inlays, etc.

(d) Teeth remote as possible from the anterior mouth.

(e) Teeth with other indications for clasps as not mentioned above.

3. This being in whole or in part impossible, choose (as above) compound retainers, especially in teeth, either requiring, or with readily removable large inlays, crowns or similar:

(a) Non precision if saddle supported at one end only.

(b) Precision (if grade of work admits and if saddles supported at both ends) or non-precision, *chiefly* removable bridges.

4. In Classes 1 and 2 add indirect retainers, if necessary, (contact or carrying stress of mastication) as in Figure 5, upon suitable teeth omitting upper and lower, centrals and laterals. These indirect retainers to be directly opposite unretained portions of saddles.

40. SUPPLEMENTARY NOTES ON CLASPS

1. All clasps must touch the enamel only. This is of greatest importance for preventive reasons.

2. *Independent movement of clasp and saddles and "slip."*—In addition to a sufficiently firm grasp of the anchor tooth, a clasp should be sufficiently resilient to allow a "slip" or a slight movement of the clasp up and down and round the anchor tooth. This movement allows the saddle or the anchor tooth to move independently in a limited degree of the saddle, minimizing torque and overload (provided the mucosa is not of soft texture), in which a non-rigid connector is needed, as already noted. This represents approximately a universal joint in which an independent movement is possible within small limitation.

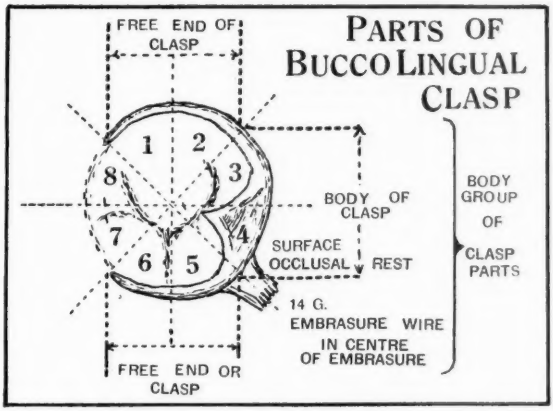

Fig. 11.—*Parts of a bucco-lingual clasp.* The arrangement varies in other types to a certain extent. Note the clasp ordinarily encircles 6-8 or ¾ the circumference of the tooth. Parts of clasp as above noted. Note position of No. 14 gauge connector in embrasure.

3. *Choice of cast, wrought, or composite clasps.*—A large percentage of losses of anchor teeth from torque, are due to the use of cast clasps, possibly too wide and too thick, lacking in resiliency, and corresponding "slip," and retaining a free saddle (a saddle directly retained at one end only) resting in turn upon soft mucosa. This is the most frequent example of the main contra-indication of the cast clasp, viz: "Cast clasps must not be used in any instance which, because of relative

Chart #4

PARTIAL DENTURE SERVICE

ROYAL COLLEGE OF DENTAL SURGEONS

FACTOR CHART

For the purpose of assisting in the determination of support, (steps #'s 1, 2 & 4) Design, Chart #3.

1. SOME FACTORS INDICATING MUCOSA SUPPORT :–

Larger saddle areas with stress of mastication carried primarily by saddles and subjacent mucosa, and without occlusal rests are indicated in proportion to :–

(a) Larger distances on each side of remaining teeth.
(b) Smaller amount of pericementum available for support.
(c) Less favorable condition of pericementum of teeth available, or not available for support.
(d) Less firm condition of the mucosa.
(e) Pressure from the antagonizing teeth above the average.

2. SOME FACTORS INDICATING ROOT SUPPORT :–

Smaller saddles with stress of mastication carried primarily by the teeth and their pericements ; and with occlusal rests, are indicated in proportion to :–

(a) Smaller distance between the remaining teeth.
(b) Larger amount of pericementum of teeth available for support.
(c) More favorable condition of pericementum of teeth available for support.
(d) More firm condition of the mucosa.
(e) Pressure from antagonizing teeth below the average

3. SOME FACTORS INDICATING COMBINATION SUPPORT :–

with stress of mastication divided between roots and mucosa, with saddles of medium area and with occlusal rests.

(a) Practically the remainder of the 2^{16} cases:

(P.S. The above hypothetical and subject to checking with 2^{16} combinations)

Fig. 12.—*Factor sheet.* From the above, in proportion to the factors above, and present in the proposed restoration, is the type support chosen: (a) root, (b) mucosa, (c) combination support of both root and mucosa.

non-resiliency, and consequent lack of slip they may subject an anchor tooth to vertical or horizontal torques from free

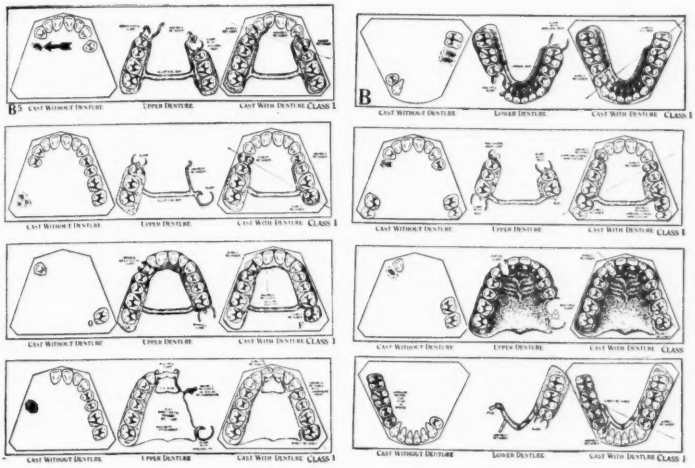

Fig. 13.—A group of Class 1 cases.

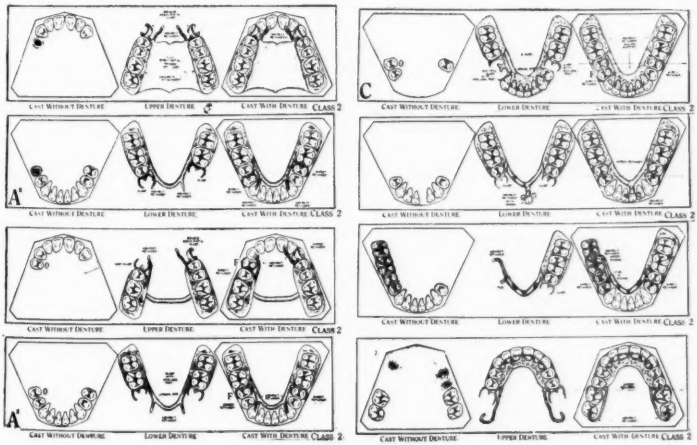

Fig. 14.—A group of Class 2 cases.

saddles on mucosa of any degree of compressibility."

Under the latter circumstances, the wrought (preferably) wire band or composite clasp is indicated, which ordinarily possess sufficient slip and elasticity to accommodate this difference or movement, and with in extreme cases nonrigid connectors.

Cast clasps find a special use in short spaces with suitable teeth for clasps at

each end of space, in which wrought clasps are contra-indicated because of danger of swallowing.

widest cross-section; (b) a body connecting the free ends which is more or less resilient. The proper position of the con-

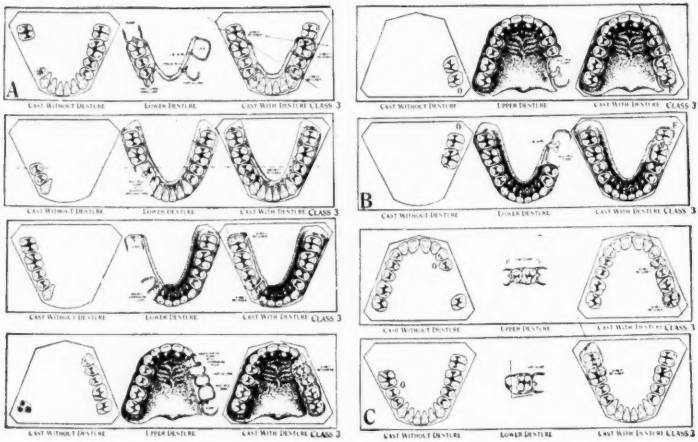

Fig. 15.—A group of Class 3 cases

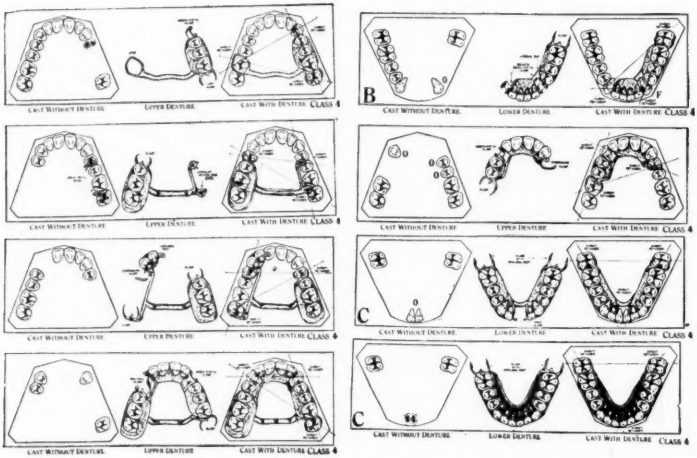

Fig. 16.—A group of Class 4 cases.

Notes on design of individual clasps.—All clasps consist of: (a) two resilient and contoured free ends or their equivalent, equidistant above and below line of

toured free ends is that of conformation to the contours of the pair of opposing convex surfaces, as chosen, resulting in a positive grip, assisted by tenso-friction,

not more than sufficient to hold the restoration to place.

Body must be (a) below leaning tooth surfaces; (b) narrow especially at right angles to fulcrum line.

41. CONNECTORS

These may be of No. 14 gauge wire placed in the embrasure except in cases in which extreme disproportion exist between the movements of the saddle and anchor tooth or for other reasons. In such cases non-rigid connectors may be used (see Figs. 2, 7, 8).

42. POSITION AND CHOICE OF OCCLUSAL RESTS

(Allocation of load to the teeth and their pericementa. *Load must be applied to teeth coincident with their long axes only.*)

At this stage the occlusal rests, (if their use is thought desirable) may be drawn in, which allocates a load to the teeth. This is also an unexplored field, and in my judgment is best taught by factors indicating root support as attached (Fig. 12), governed by the general principles that saddles resting on soft mucosa tend to throw bulk of the stress on the teeth, and also that teeth of diminished or diseased pericementum should not be given this duty. Some writers on this subject condemn this principle, thus elminating the allocation of the load for the tissues designed by nature for the purpose, the dental pericementum.

In many cases the sequelae following non-occlusion may be prevented with large occlusal rests. Capillarity in these may be minimized by keeping the gold out of contact with the deep sulci.

A sequence for the development of these follows:

1. Determine support of piece (see factor chart, Fig. 12).

2. Sketching in occlusal rests.

(a) If mucosa support no occlusal rest.

(b) If root support entirely (removable bridges) occlusal rests (Fig. 2) with or without saddles.

(c) If mucosa and root support with *ample space* for occlusal rest: quarter, half, full, or multiple occlusal pads as required to close space.

(d) If both mucosa and root support with *small space* for occlusal rest; buccal or lingual entry surface occlusal rest: mesio-distal, bucco-lingual, or linguo-incisal, rigid loops; recessed occlusal rests. Remove small amount of enamel from marginal ridges of upper and lower teeth involved, if absolutely unavoidable, and without approaching the dentin.

Note.—Usually all teeth adjacent to spaces must share support. All mesio-distal clasps and bucco-lingual and line-angle clasps considerably covering occlusal cone of tooth attached act as occlusal rests.

Note.—Upon all uncut cone-shaped teeth (e.g., cuspids) either mesio-distal—bucco-lingual—or linguo-incisal rigid 2-3 loofs are indicated.

43. CONSTRUCTION

Maintenance of accuracy is the chief difficulty in construction and much research in stresses and strains in bent and cast metal to avoid distortion is necessary. A shrunken casting or distorted framework exerts a permanent stress on anchor teeth which must result in ruin. Interference in anatomical articulation may be checked by intelligent use of adjustable articulators. Escapes provided on occlusal surface tend to reduce over-load. In Figure 6 a series of items in construction may be noted, details of which would fill an essay of considerable size.

44. INSERTION OR INSTALLATION

Too much stress cannot be laid on the necessity for proper adjustment at this stage, both before, immediately after, and for a short time subsequent; and during the initial stages of the practical use of the appliance. At this stage the final and accurate distribution of stresses on teeth, mucosa, or both, is done, and to a

large extent the life-history of the remaining teeth is determined. The operation may be conducted entirely by the use of thin wax, carbon paper, and spot-grinding, not omitting the instruction to patients as to method of insertion and removal.

45. MAINTENANCE AND REPAIR (PRESUPPOSING HEALTHY ORAL CONDITIONS)

Preventive items (in part) (the dentist's part): (1) settling clasps and saddles, gingival impingement, etc., correction; (2) correction of impingement hard area or elsewhere; (3) watching for overload from occlusal rest with no rebasing in expected absorptions (especially after recent extraction); and for various overloads not correctly anticipated in saddle and occlusal rest designs.

Oral health conditions (the patient's part): (1) cleansing five times per day; (2) saliva flush; (3) removal at night; (4) use of notification slips for periodic examination to be furnished by dentist; (5) report for repairs, rebases, etc., if necessary.

The first three items of personal hygiene, as above, may be given direct appeal, with reference to the parallel of maintenance of all kinds. Prophylactic notification system is equal with partial denture notification systems in the opportunity for prevention, as injuries which may result from broken clasp, occlusal rest or similar, cannot be foretold with accuracy.

46. CONCLUSION

Realizing with concern the lack of professional knowledge of the subject of partial restorations, and to a certain extent, the lack of real interest in the subject, I offer the following suggestions in conclusion.

1. Research of partial denture problems to be included in as many research programs as possible. From probably few causes are more teeth lost than at present from lack of this knowledge. Here follows a few suggested details:

a. Design

1. Checking hypothesis of design and classifications with other cases.

2. Study of proper distribution of stresses of all kinds on teeth, mucosa, or combination support.

3. Clasp design to minimize capillarity and other disadvantageous factors.

b. Construction

1. Simple and standardized impression technic.

2. Elimination of warpage and distortion by similar standardized instruction.

3. *Reduction of cost* and improvement of production methods.

c. Installation, maintenance, etc.

1. Periodic records of selected cases checking efficiency of designs in present use.

SOME INTERESTING FACTS CONCERNING THE X-RAY

By JAMES H. PROTHERO, D.D.S., Chicago, Illinois

(Read before the Illinois State Dental Society, Springfield, Illinois, May 9-11, 1922)

AMONG the many remarkable scientific advances within the last thirty years, none are more interesting and truly wonderful than the discovery of the X-ray. The story of how nearly scientists came at different times to finding it, and yet failed, and how by accident it was discovered, is very entertaining.

As a matter of fact the development of electrical science from the very first experiment with amber down to the latest developments in the radio field, has been replete with unique surprises.

Nearly three thousand years ago someone discovered that by rubbing a bit of amber with silk, it would pick up small pieces of straw and other light substances. The Ancients believed that the curiously shaped brownish pieces of this material found along the shores of the Baltic were Jupiter's congealed thunderbolts, or in other words, the end product of lightning. This was a close guess for we now realize that the attraction exhibited by these bits of mineralized resin is identical with that force which Franklin brought down from the clouds with his "kite and bottle and key."

For nearly two thousand years this classic experiment apparently satisfied the curious, as no records exist of any further efforts to determine whether other substances possessed this property.

In 1570 Dr. William Gilbert discovered that glass, sulphur and other kinds of resin, when energized by friction, would behave in a manner similar to amber. Crude frictional machines were soon devised for generating larger quantities of the newly discovered force, and many interesting experiments are credited to Gilbert and his co-laborers. The Greek name for amber is electron, and to commemorate the ancient experiment Gilbert called the force with which he was experimenting, "electricity," which name it bears today.

The work of Gilbert, Gray, Franklin, Coulomb, Galvani, Volta, Davy, and many others, although not particularly correlated at the time of their experiments, constitutes the preliminary basis of modern electrical science.

Contributing particularly to the line of experiments which resulted in the discovery of the X-ray may be mentioned Faraday, Clerk Maxwell, Geissler, Crookes, Hertz, Lenard, and Roentgen. Others have given much also, but these deserve special credit for having devised essential apparatus and carried forward original investigations of great value.

Faraday was probably the first to use a partial vacuum tube and experiment with electric discharges in rarefied gases, while his studies in electro-magnetic induction led to the development of the dynamo.

Clerk Maxwell, in 1866, demonstrated mathematically that electrical disturbances ought to develop waves in the ether, that intangible substance which pervades all space.

Heinrich Hertz, in 1888, demonstrated experimentally, the truth of Maxwell's mathematical proposition. Hertz devised an apparatus called an oscillator consisting of an induction coil arranged with metal ball terminals so related as to form a spark gap. In action, when sufficient difference of potential had been established to overcome the resistance between the dielectric or air between the terminals,

sparks jumped the gap and developed in the ether, waves which passed out in all directions, but which manifested themselves more strongly in a direction at right angles to the spark gap.

These were called electro-magnetic waves. To detect them Hertz devised a very simple but effective appliance of wire, bent in the form of an open ring and having ball terminals, thus forming a spark gap.

When held so that the ether waves passed through the ring, the wire vibrated and sparks jumped the gap. This was called a resonator. The effect of the oscillator upon the resonator when a current passes has been likened to what occurs when two tuning forks of the same pitch are placed some distance apart and one is caused to vibrate. The ether waves which in this case conduct sound, set up corresponding vibrations in the inert fork.

It is this principle of generating electro-magnetic waves which forms the basis of present day wireless telegraphy. The distance between the crests of long distance wireless waves is frequently 15,000 meters or about nine miles. These electro-magnetic waves travel with the speed of light or 186,300 miles per second. If sufficient energy could be imparted, they would circle the globe seven and one-half times in one second.

In 1869, Geissler devised the first permanent vacuum tube and succeeded in rarefying it to a much higher degree than had previously been possible. Heretofore, in all the experiments with rarefied tubes, from Faraday's observations down to and including the work of Geissler, the vari-colored luminosity within the apparatus, when energized, was of greater interest. This luminosity originated at the anode and extending toward the cathode partially filled the tube, presenting purple, pink, green, yellow and gray tinges depending on the degree of rarefaction of the tube and the character of the contained gases. On raising the vacuum of the tube to a high degree, the anode luminosity disappeared and from the cathode there was projected toward the anode a faint line illumination, subsequently called the cathode stream.

In 1879, Crookes modified the Geissler tube by inserting a third terminal in the middle of the glass cylinder to serve as a cathode while the two end terminals were connected to form the anode. With this as well as with the Geissler tube he performed many varied and interesting experiments. He demonstrated that the cathode emitted some sort of radiation, that it cast a shadow of an opaque object on the tube walls, that it would revolve a vane placed within its path and that it could be deflected by a magnet applied from without.

He modified the flat cathode terminal giving it a concave form which served to concentrate the cathode stream at a focal point. By locating the anode at this point it became intensely heated.

These observations led him to believe that the cathode stream consisted of negatively charged particles of matter in a minute state of subdivision, a deduction which has since been verified.

One other experiment of Crookes deserves special mention. On raising the vacuum of the tube to a high degree he observed that at a point opposite the dark cathode end, on the inner surface of the glass, a green patch appeared which afterward was shown to be the source of the X-ray.

In 1892, Hertz demonstrated that the cathode stream would pass through gold leaf inserted in its path within the tube. Experiments with silver and aluminum foils showed similar results. These observations led him to believe that since the cathode stream could pass through metals within the tube, something must occur outside the walls. Crookes had previously endeavored to bring the stream outside the tube but was unsuccessful.

Before Hertz could accomplish anything in this prospective field, death ended his most useful and interesting career. His work, and particularly this latest suggestion, was continued with en-

thusiastic zeal by Lenard, his pupil and co-worker.

Since in Hertz's latest experiment the cathode stream passed through aluminum foil within the tube, Lenard constructed one in which an aluminum window was set in the tube wall at the point of focus of the cathode steam. When energized, he found that the stream passed through the metal window, that it caused phosphorescence of uranium, that the stream could be deflected by a magnet, and that it possessed actinic properties as shown by its action on photographic plates. He further observed that the higher the vacuum, the more penetrative became the external cathode rays.

That he was working with X-rays, but failed to recognize them, is now a generally conceded fact. The main point which Lenard and all experimenters before him failed to observe, but which Roentgen recognized was that when cathode rays strike matter they produce a different kind of radiation.

In 1895, Roentgen who had been interested in Lenard's work, was one day experimenting with a Crookes' tube. His attention being diverted from his work for a short time, he without design laid the energized tube on a book which contained a flat key used as a book mark. Beneath the book and in a plate holder was an unexposed photographic plate. Later the plate was used, with others in outdoor photography and developed in the usual manner. One of them showed the shadow of the key which he recognized, but could not account for its presence.

In the Lenard tube with its aluminum window, it had been demonstrated that the cathode rays passed out through the metal. The tube used by Roentgen was a glass walled tube with no such means of exit for the rays.

It was thought by Roentgen, and others, that nothing could pass through the glass, yet something within or outside the tube had caused the image of the key to appear on the plate. To prove or disprove this theory, the book containing the key was again placed upon an unexposed plate, the tube placed upon the book and energized, and the plate developed. The results were as surprising to Roentgen, as it was shortly after to the whole world, for the shadow of the key was on the plate.

Various other experiments were conducted which led him to the conclusion that a ray invisible to the eye, but capable of penetrating opaque substances emanated from the tube. He then placed his hand upon an enclosed photographic plate, developed the cathode stream in a Crookes' tube in close proximity to it, and secured a radiograph of the bones. He further found that the emanations from the cathode stream caused fluorescence in a cardboard coated with platino-barium cyanide, not only on the side presented to the tube, but on the reverse side as well. This led to the experiment of placing his hand between the screen and the tube with the result that on the reverse side the shadow of the bones was clearly outlined.

Roentgen's discovery made a most profound impression, not only in scientific circles, but throughout the world. Here was a new kind of ray or light, hitherto unsuspected, which although beyond the visibility of human eye, could leave its record on a photographic plate. Not only that, but by means of suitable apparatus, one could virtually look into the human body, discover fractures and dislocations of bones, locate foreign bodies, and bring into view pathologic conditions not otherwise recognizable.

This invisible radiation, the existence of which was apparent only by its results, was puzzling in the extreme. It was an unknown quantity and in accordance with algebraic custom Roentgen named it the X-ray. It is frequently called the Roentgen Ray in honor of its discoverer, but the first name given it seems quite appropriate and is in general use.

Present Methods of X-ray Production

Various radiographic equipments are in use at this time, description of which is unnecessary further than to say that by means of induction coils, motor-generators, transformers, etc., a current of high voltage, low amperage, and unidirectional in character is readily developed for passage through the X-ray tube.

The tubes used at present are of two distinct types; first the gas tube which although reduced to a comparatively high vacuum, still contains a small amount of air or gas, the purpose of which will be shown later.

Second, a type known as the Coolidge tube, so-called from its inventor, and which is reduced to as nearly a perfect vacuum as human skill can produce. It is said that this tube contains less than one millionth its cubic content of air or gas.

These tubes which resemble each other in general form consist of a sphere of glass from three to seven inches in diameter, having two axial extensions, opposite each other, through which wires pass to the interior terminals.

The gas tubes, have, in addition to the extensions mentioned, one and sometimes two other projections, carrying fixtures for raising or lowering the vacuum and for taking care of the overload.

Projecting inwardly from one of the axial tubes is a rod which terminates in the center of the sphere in a large short cylinder, the end of which is bevelled at an angle of 45 degrees to the long axis of the tube. This is called the anode or positive pole. Through the opposite axial arm projects another metal wire and rod which terminates within a short distance of the anode. This presents a concave surface toward the anode and is called the cathode or negative pole.

The tube when placed in a suitable holder and properly connected is energized by passing through it, a high tension current of from 10,000 to 100,000 volts and from 10 to 60 or more milliamperes, depending on the requirements.

The discharge from the cathode to the anode consists of a stream of negatively charged electrons, estimated to be 1/1800 the mass of a hydrogen atom. These electrons are the result of the disruption of gas atoms in a highly rarefied gas tube, while in a Coolidge tube, practically devoid of gas they are supplied by the incandescent filament of tungsten.

Their velocity is estimated at 1/30 to 1/3 that of light, or from 6210 to 62100 miles per second, varying with the strength of current.

These electrons serve as conductors for the current since the latter cannot, without some such medium, jump the gap in a vacuum.

Although invisible to the eye, and almost inconceivable as to mass, the terrific speed at which they are driven across the gap, results in the development of intense heat in the center of the anode. To avoid fusion of the latter, the central portion is made of platinum, or tungsten.

The point of contact or focus of the cathode stream against the anode is the site of development of the X-ray, which as it is formed radiates outward in all directions, but particularly from the active hemisphere.

Physicists believe that the sudden stopping or impact of the swiftly moving electrons against the anode and each other is the direct cause of X-ray emanations. These rays after their exit from the tube, set up transverse etheric vibrations, the wave length of which cannot be measured by the usual diffraction grating. They can, however, be estimated by passing them through a crystal. This has been done, the results of which show them to be about 1/10,000 that of light waves or about .014 of a micron.

Accurate calculations have shown that the etheric vibrations of X-rays are the shortest so far discovered. This places them at the lower end of the spectrum, beyond the violet. They are in fact known as the tri-ultra violet rays. Similar calculations in reference to long dis-

tance etheric waves places them at the upper end of the spectrum, or far beyond the red. Further, it has been demonstrated that light rays, X-rays and the gamma rays of radium are alike except in wave lengths.

Briefly stated, the development of the X-ray is accomplished by the separation of electrons from molecules, their projection at high speed, and their sudden arrest of motion.

Important Characteristics

The principle characteristics of the X-ray to be considered have been classified by Hirsch as follows:

1. Their effect on photographic plates.
2. The development of fluorescence in certain substances.
3. Power of penetrating opaque substances.
4. Action on living tissue.
5. Power of causing chemical reaction.
6. Property of ionizing gases.

Brief mention only can be made of some of these characteristics. The two factors, the power of acting on photographic plates and of penetrating opaque substances are particularly interesting. In regard to photographic properties, it is believed that when either light or the X-ray is directed upon a molecule of silver salt an electron from the latter is set free. This disturbance of the molecular cohesion is sufficient to render the entire molecule developable. The penetrability of opaque substances by the X-ray is believed to be due to its diminutive wave length.

Fluorescence has been defined as "A phenomenon in which radiant energy of one wave length is absorbed by a material and emitted as radiant energy of a longer wave length." This property of the X-ray is made use of in fluoroscopic examination of the living subject, and by means of intensifying screens in radiographic technic for accellerating the speed of exposure.

Since X-rays are developed within a very small area, at the point of concentration of the cathode stream against the target, and the emanation radiates out in all directions in straight lines, it becomes a difficult problem to secure shadow studies of accurate mathematical dimensions, of objects interposed in their path.

A tube placed close to the object radiographed will result in an enlarged shadow on the film. A film placed a considerable distance from the object will result, not only in an enlarged shadow on the film, but the details and the shadow itself will be more or less indefinite.

A film placed at other than a right angle to the energetic central ray will usually result in a distorted image. A shadow projected on a curved film will be more or less disproportioned.

Penetrative power of X-rays decreases in inverse ratio to distance of target from object.

When primary rays strike dense objects, secondary radiations are developed, which, although traveling in straight lines assume angles at variance to the rays from which they originate. These secondary rays are a detriment as they tend to fog the film and render the shadow more or less indefinite.

Time, penetrative power of the rays, distance, and relative position of tube, object and film are important factors which must be correlated in order to produce good radiographs.

The effect of the X-ray on living tissue may be soothingly stimulating or insidiously destructive, depending on conditions under which applied. When judiciously used, in selected cases, it is a most valuable curative agent. Lupus Vulgaris, rodent ulcer, certain types of malignant tumors and some superficial infections are frequently benefitted and sometimes eradicated by its application.

Some of the ill-effects resulting from undue exposure to the X-ray are as follows: Applied indiscreetly it will cause a condition similar to sunburn. Con-

tinued exposure results in dermititis, acute at first which may disappear if application of rays is discontinued, but chronic if exposures are prolonged. Temporary loss of hair is not uncommon but if continued lengthy exposures are made permanent baldness may result, due to destruction of the hair follicles. Pigmentation of the skin and splitting as well as entire loss of the finger nails are occasionally recorded.

Radiographers who constantly work in the presence of the ray without adequate protection are sometimes troubled with the development of horny excrescences on the hands and face. This condition frequently persists long after exposures to the rays have ceased. In some cases epithelioma and various other malignant tumors attributable to X-ray burns have been reported.

G. Contramoulins, Chief of Radiographic Laboratories, Paris, after twenty years of careful effort on his part to avoid injury reports that up to the war he had apparently succeeded, but imperfect protection while searching for foreign bodies, had brought on the disaster he so feared and he predicts that he shall end in the manner of his late associates.

The discovery of this mild but dangerous force of Nature has resulted in alleviating human suffering, and prolonging life. It has lightened the burdens of those engaged in the healing art to an immeasurable degree, particularly in the surgical field, where, with his eyes, the operator can as previously stated examine obscure wounds, fractures, dislocations and locate foreign bodies, and beforehand determine the best method of procedure.

In the field of physical science the X-ray has brought to light many hidden and wonderful secrets of nature. So much has been discovered by its aid that the physicist has found it necessary to revise his theories and reconstruct his hypotheses.

To illustrate this last statement and show wherein the X-ray has played an important part, we will revert to a few things which occurred about the time Roentgen made the great discovery.

In 1894, Rayleigh discovered in the atmosphere a new gaseous element which was named helium. Soon after Ramsey found four other elements, viz: neon, argon, krypton, and xenon, all possessing somewhat similar properties, all incapable of entering into chemical combination with other elements except at white heat. The discovery of radium emanations by Bequerel almost immediately followed. Shortly after the Curie's isolated the chloride and bromide of radium. This element has a high atomic weight and possesses the property of decomposing silver salts similarly to the X-ray.

Shortly after Madame Curie discovered that radium broke down or decayed into a gas. Within four days from the formation of its salt half of it decomposed, but during that time it evolved three million times more energy proportionately than was developed from any known chemical action. This gas decomposed into helium, the elemental gas discovered by Rayleigh.

In an effort to utilize some of the enormous energy resulting from the decay of the radium emanation, Ramsey placed it in water. Instead of helium showing as an end product, neon appeared, the second of the elemental gases named. Copper sulphate was then added to the water and instead of neon showing, as an end product, argon appeared.

In this same experiment the water was partially decomposed into its constituent gases, not in the usual proportion however, but with a decided percentage loss of oxygen and a marked percentage increase of hydrogen. Further there was a loss of copper, and lithium appeared where none had been present before. The deductions were that through the influence of radio-activity something had been changed into hydrogen and copper had been degraded into lithium.

Professor J. J. Thompson has shown that in the energetic field of an X-ray tube many substances give off particles

charged with positive electricity, that these particles are independent of and differ in character from the gas from which they originate, that they are of two kinds—one to all appearance identical with the hydrogen atom, the other resembling in every respect the alpha particles which emanate from radio-active substances.

These experiments of Thompson's conducted in the X-ray field without employing any radio-active substances proves the work of Ramsey and others and establishes the fact that hydrogen results from the debasement of other elements under favorable conditions.

It is evident then, from these and many other check up experiments that uranium is transmuted into radium, that radium may be transmuted into helium, neon or argon, that copper under the influence of the alpha rays may be reduced to lithium, that many inert substances break down into hydrogen when subjected to the energizing action of the X-rays and alpha corpuscles, and finally that the radium emanations are themselves the product and evidence of elemental decay.

These facts which have been worked out time and again by the world's greatest scientists form the basis of the new physics, and in this new science the X-ray has played a most important part.

The theory of the unity or oneness of matter is very old. It has been repeatedly advanced since Lucretius' time two thousand years ago, and as repeatedly scoffed at and denounced as senseless, yet in the light of radium degradation and X-ray revelations, there is a growing belief that it may prove true.

Professor J. J. Thompson has expressed the opinion that all of the elements represent successive condensations of one primary stuff whose atoms called electrons or corpuscles weigh less than the 1/1000 part of the lightest known terrestrial element, namely hydrogen. This primary stuff is negative electricity which is therefore a true chemical element.

VITAMIN DEFICIENCY DISEASES AND THEIR RELATIONSHIP TO DENTISTRY

By EDWARD H. HATTON, B.L., M.D., Chicago, Illinois

(Read before the Illinois State Dental Society, Springfield, Illinois, May 9-11, 1922)

IT SEEMS probable that the year 1911 will be considered as the beginning of a new epoch in the progress of medical and dental science comparable only to the discovery of anesthesia and the relationship of bacteria to disease. This year marks the coining of the word vitamine now generally abbreviated to vitamin and the beginning of so universal an attack on the nutrition problem as to merit the statement made by Emmett before the Chicago Medical Society, February 15, 1922, that,—"There are more research laboratories and institutions working intensively, directly or indirectly, on vitamin studies at the present time than on any other one subject." Primarily, I believe so much emphasis is being placed on this subject because of the tremendous emphasis that was put on nutrition by the World War. It was realized, as never before, that nourishment is of fundamental importance in relation to health, vigor, disease and recuperation. The peculiar and unique place which nutrition occupies in the application of therapeutics today is being recognized more and more by physicians and surgeons, dentists, nurses and dietitians.

It is not the purpose of this discussion to attempt to cover what has been presented so excellently in recent volumes such as the Sherman and Smith monograph published under the auspices of the American Chemical Society, or Eddy's Vitamine Manual; to these or similar volumes all dentists who wish an adequate working knowledge of such material as is now at hand for the formation of diets must be referred.

As early as 1720 Kramer wrote that neither medicine nor surgery could give relief in scurvy. "But if you can get green vegetables; if you can prepare a sufficient quantity of fresh antiscorbutic juices, if you have oranges, lemons, citrons, or their pulp and juice preserved with whey in cask, so that you can make a lemonade, or rather give to the quantity of 3 or 4 ounces of their juice in whey, you will, without other assistance, cure this dreadful evil." And Lind, writing in 1757, pointed out that while lemon juice retained its antiscorbutic property sufficiently well to make it useful for long voyages, there was no hope of preventing scurvy by means of dried spinach leaves since this had lost during its preparation "something contained in the natural juices of the plant" which "no moisture whatever could replace." Budd prophetically and clearly stated in 1847 that the action of antiscorbutic foods was due to an essential element, which it is hardly too sanguine to state, will be discovered by organic chemistry or the experiments of physiologists in a not far distant future.

Takaki became the highly honored scientist of his day in Japan by his prevention of the then common disease beriberi. During the years 1878 to 1882 it had an officially reported rate of 25 to 40 per cent of the Japanese naval forces. By modifying the rations in some respects Takaki succeeded in practically eliminating this disease from the Japanese navy.

By 1911 Funk, who coined the name vitamine, McCollum, Hopkins, Osborne and Mendel were already well started with their researches which since have become world famous, and together with the contributions of hosts of other workers

have made the tremendous progress of the last ten years, a progress which has been handicapped by the inability to isolate these substances or even identify them, and further limited by the method of experimentation by animal feeding.

By vitamins or accessory food factors are meant certain substances of unknown composition whose absence in foods prevents growth, retards development, or produces definite diseases. Their presence or absence is entirely independent, so far as present methods of analysis are able to determine, of the composition or energy producing value of such foods. Foods of identical composition, as to the elementary substances, proteid, fat, carbohydrate, and mineral salts, even to the same proportion of amino acids in the proteid component, may differ radically as to vitamin content. So far no method of testing their presence or absence except that of animal feeding is at hand, and this holds true of both qualitative and quantitative estimations. No accurate measure, is or can be used, therefore, except that on a certain diet an animal develops a deficiency disease and so many minims or cubic centimeters of orange juice daily, or so many grains or grams of carrots, cabbage, yeast or what not in each day's ration will prevent or in a greater dose cure the same disease. Whatever these substances are they are on the whole singularly perishable, and very susceptible to heat, drying, and alkalis, though varying to a considerable degree even in these respects. They are, therefore, substances whose identity is quite a mystery as yet, and known only by the effects they produce. It is not expected that they will always remain unidentified, since their recognition is the avowed object of many of the best chemical minds of the world.

Funk's vitamin it was found is a substance whose absence in foods causes not only the disease beri-beri, but prevents growth and development or produces a poly-neuritis, the latter effect most easily shown in pigeons. It is soluble in water. McCollum's substance on the other hand is most frequently found in connection with both animal and some other fats, and therefore supposed to be soluble only in fatty substances. Its presence in foods is necessary to produce growth in young animals and its absence frequently results in a rather typical disease of the eyes. From this grew the conception that there are only two forms, a water soluble and a fat soluble type of vitamin and the terminology fat-soluble A and water soluble B to distinguish them was adopted. For some time some workers like McCollum refused to admit that there is a third type whose absence in foods results in scurvy, but this is now universally conceeded, and since this substance is soluble in water the term water soluble C was employed to distinguish it. This confusing terminology was further embarrassed by the fact that it soon became evident that the fat soluble A is not only fat soluble but also water soluble and widely distributed in the parts of plants that contain no fatty substances. The notion that these three vitamins do not include all the various forms is at the present time growing, and there is a disposition to extend the terminology to include these, and to distinguish them simply as Vitamin A, B, C, D, and so on. It is possible that under the B group there are at least two, and there is a disposition by Funk and others to believe that there is a specific vitamin factor active in the production of rickets.

There is now a rather substantial agreement that the vitamin food factor is of the highest importance in both health and disease in all that concerns calcium metabolism, and it is just these phases that concern and interest dentists. Howe, the two Mellanbys, and the McCollum group have concerned themselves with the oral changes. Howe's experiments have been chiefly on deficiency diets in guinea pigs and rabbits, both belonging to the rodent group, and therefore having teeth with open apices and in continuous growth, that is they never

outgrow the formative period. He is able to cause extensive absorption of the alveolar process, loosening and disintegration of the hard parts of the teeth. He believes that the decalcification extends not only to the alveolar process but that calcium salts are absorbed from formed dentin and hard parts even to the extent that the teeth become so soft that they may be bent entirely out of the shape like a piece of cartilage. He seems satisfied that he has produced not only what appears to him to be pyorrhea but caries, and that this caries extends from within the pulp canal outward rather than from the crown toward the pulp canal. He also inclines to the belief that no one vitamin is specific for this condition but that all three are factors. Zilva and Wells made microscopic sections of both normal and scurvy diseased guinea pigs, and found that the tooth is one of the first, if not the first part of the system to be affected by a deficiency of antiscorbutic material, that is vitamin C, and that changes of a profound nature may occur in the teeth even when the ordinary scorbutic symptoms are still so slight as to be almost unrecognizable. These changes are a fibroid degeneration of the pulp frequently with a complete disappearance of the pulp cells or any distinct cell structure. They also found similar changes in the teeth of monkeys similarly diseased. Robb and his coworkers in the Minnesota physiological laboratory were able to produce some similar changes in the pulps of their experimental animals but the outstanding feature of their studies is the frequency of the production of what they call osteoiddentin even to the extinction of the pulp chamber, and they are inclined to be amazed because Zilva and Wells did not find similar calcareous degeneration of the pulps studied by them. They are agreed that during the progress of the scurvy there is a great loss of calcium and that a scurvy diet in man causes a lowering of the alkaline reserve of the saliva. They do not describe a decalcification of the formed tooth structure or any marked degeneration of its substance.

It has been suggested by Bebb that the changes of the teeth of rodents and those of the human under conditions such as are now under discussion are in nowise comparable, because wearing away of the crowns of rodents' teeth is not only physiological but necessary to the very existence of the rodent. Growth in the rodents' teeth is continuous and calcium metabolism is active in them up to old age and death. The notions that the absorption of human teeth can proceed by any other fashion than by the conventional process and that caries proceeds from the pulp outward are also quite revolutionary and need very thorough demonstration. Dietary deficiencies in the guinea pig produce scurvy because the guinea pig is very prone to this disease, and these changes while extreme are not to be confused with human pyorrhea and caries. In the human such deficiencies may be a factor in the production of these conditions but the relationship is not yet demonstrated.

Mellanby found that diet had a marked effect upon the development of the teeth in puppies, and the nature of the diets used makes it appear probable that vitamin A is an important factor in the results obtained. The British Research Committee was so impressed with her demonstration that they made this statement, "Apparently the formation of calcified enamel and the adequate spacing of the teeth in puppies is dependent on an abundance of some such factor. In human beings calcification of the teeth is a much slower process and continues till the eighteenth year. In order to ensure perfect calcification of the teeth, therefore, it is necessary that the diet should contain adequate supplies of the accessory food factor up to this time, and a deficiency at any period will be reflected in a corresponding defect in the formation of the teeth."

It should be observed that all of these laboratory animals when fed deficiency

diets gradually eat less and less, and that it is easy to confuse the symptoms of starvation and under nutrition with those of the deficiency in diet under study.

McCarrison in his studies has been able to demonstrate that the resistance to infection in laboratory animals is greatly reduced by diets deficient in vitamins. While his experiments were more vitally concerned with the tropical diseases common in India where he worked, especially in the production of gastro-intestinal disease, the application is universal and the susceptibility of individuals to dental infection probably is increased as the result of a diet deficient in vitamins.

The causation of rickets is at the present time not agreed upon. Since the end results of rickets are frequently the beginning of dental deformity and dental disease, some consideration of this question is warranted. Agreement to the extent of the importance of the three factors of vitamin, mineral metabolism, and hygienic conditions is found, but little as to the relative importance of each. Hess contends that the factor of sunlight is of vital significance, Mellanby and Funk, that a fat soluble vitamin plays the dominant role in the prevention and cure of rickets; and McCollum believes at this time that he has demonstrated that the occurrence of rickets depends upon a vitamin deficiency combined with a perverted mineral composition of the food supplied. His animals develop rickets when the fat soluble vitamin is low or absent, and on a diet in which the phosphorus content is low and the calcium content either normal in amount or high; and he believes that hygienic conditions are only contributory causes.

Pellagra at this time is not believed to be primarily a vitamin deficiency disease. It is supposed that it is the result of using foods poor in certain fractions of the human proteid molecule, and vitamin deficiency is only a contributory factor in the origin of pellagra, as of tuberculosis and some other chronic infections.

There is not sufficient evidence at this time to warrant a belief in the vitamin origin of the two chief dental diseases. But since the vitamin content of food is of such great importance in growth, development, calcium metabolism, and the ability of animals to carry and nurse their young, one must be impressed with the serious nature of a vitamin lack in human diets in the same respects. Vitamin poor diets in both the mother and the child cannot produce well-formed dental arches with a complete complement of well placed, well spaced teeth, covered with a uniformly thick layer of hard enamel. Furthermore infantile scurvy is distressingly present under modern conditions, and the prevalence of rickets is increasing under the same conditions. McCollum is inclined to attribute these changes to the gradual alteration of our diets, as the result of the improvement in agricultural methods and distribution so that the residents of the temperate climates have become confirmed in the use of large amounts of cereals in their diets to the exclusion of the vitamin containing foods. It is not necessary to emphasize here that foods must not only contain vitamins, but also carbohydrates, fats, mineral salts and proteids, and the last two of the right kind and composition. There radiates from all of these researches an atmosphere of enthusiasm and optimism that is rather intoxicating, and the wished for millenium seems much nearer at hand as their results seem to put into our hands a cunningly devised tool just at the time when dental societies and organizations everywhere are preparing extensive preventive dentistry programs. No such program is complete without a place for the dietitian, and a method to improve this phase of the nutrition of young children, even the unborn.

All three vitamins are found in considerable quantities in raw cabbage, carrots, cauliflower, lettuce, spinach and milk. Onions, parsnips, fresh peas, potatoes, and sweet potatoes contain considerable quantities of at least two; the deficiency

of the potato is admirably compensated for by the sweet potato. The cereals contain large amounts of vitamin B, that is the growth and anti-neuritic factor, and this is true of brewer's yeast and the yeast preparations. Butter, egg yolk fat and cod liver oil are rich in vitamin A, that is the factor so essential to growth and calcium metabolism. Bread, the staff of life, as it is usually made from white flour contains only a trace of vitamin B and even smaller amounts of the other two forms. Whole meal bread on the other hand has considerable amounts of B and a moderate amount of A. Milk, therefore is probably the most important constituent of an ideal diet. Lusk states that the minimum allowance in an ideal diet is one quart a day for each child and a pint for each adult in the family. Pasteurization and storage reduce the vitamin content of milk, and from the standpoint of vitamin richness boiling for a short time just before using is much less harmful than pasteurization. There is ample justification for the use of certified milk, boiling the milk just before its use when sterilization seems wise in the preparation of an infant's food. McCollum and others object to the use of sugars in any but minimum amounts in dietaries because they contain no vitamins and because they quickly satiate the appetite so that the desire for the vitamin containing food stuffs is destroyed; furthermore since they are pre-digested they are quickly absorbed and cause rapid variations in the osmotic pressure of the blood, the body fluids and in the various organs.

Since aging, storage, and the handling of preparations containing vitamins rapidly reduce their vitamin content it is very evident that the surest and best container is the fresh food stuff in which they naturally occur. There seems little sense in the use of a substance like yeast for its vitamin content in a human diet under normal conditions. It may have some therapeutic value but it should be consumed then like a drug under the direction of a competent physician. Its vitamin content is limited to one factor and that factor, as far as the present results indicate, is of less importance in the formation of a strong dental arch and its preservation than either of the other two.

Sherman and Smith close their monograph by saying, "Even with our present knowledge we believe it safe to say that with a dietary selected to make the best use of our ordinary staple foods there will rarely if ever be occasion to purchase vitamins in any other form, or to give any greater anxiety to the vitamins than to some other factors which enter into our present conception of nutritive requirements and food values." *The British Medical Journal* on February 11th gives this thought the leading place on its editorial page reiterating that an abundant supply of vitamins exists in all fresh vegetables, and that a considerable quantity occurs in milk and meat, provided the latter substances are obtained from animals fed on fresh foods. "A normal adult," it says, "living on an ordinary diet containing a reasonable proportion of fresh vegetables is, therefore, certain of obtaining a plentiful supply of vitamins." *The Journal of the American Medical Association* in comment says, "Of all the mass of evidence which has accumulated relative to these substances, this fact is the point of greatest importance. It is, however, very unfortunately, the one point which those commercially inclined are unwilling to recognize."

It would seem that the solution of some phases of the diseases of the dental arch is a little nearer at hand, but it must be emphasized that these studies are only in the beginning and their final significance is only a matter of conjecture. One needs only to go back to the beginning of bacteriology to find a situation comparable with the present. It was then confidently expected that the final solution of the disease problem was at hand; it even seemed that it might solve the problem of both pyorrhea and caries. At the present time we are quite familiar with the limitations of the applications

of bacteriology, but no one would suggest giving up the contributions of bacteriology entirely because they fell so far short of the optimistic prophecies of the first years. And so with diet, let us realize that these investigations are only in the beginning, that so far we are working with intangible substances, that the methods of progress are necessarily very slow, and the results frequently contradictory. We must neither be carried away by our enthusiasm nor unduly influenced by our preconceived notions. Let us critically examine all things, and hold fast only to what seems worth while. The dominant philosophy of the present is probably pragmatism, and the evaluation of the whole subject of the vitamin hypothesis must rest on the results achieved by its application to the prevention and treatment of disease.

Discussion

S. E. Munson, Springfield, Illinois: There is one other subject which I think ought to be brought up in connection with the vitamin theory, and that is bacteriology. In the future we will have to know more about bacteriology than we do at present. Some of the diseases that are said to be caused from lack of vitamins may be really caused from increased bacterial flora in the intestines, produced by improper diet. It was McCullom who pointed out that in cases of scurvy the large intestine is filled with putrefactive bacteria. In the early symptoms of scurvy the blood flows from the gums and other mucous surfaces of the body, and this is one of the conditions we observe in some other forms of bacterial infection, thereby destroying the coagulation properties of the blood. So that bacteria that are allowed to form in the cecum and large intestine in great numbers, as quoted above, of the putrefactive type, may by poisoning the system by absorption, bring about the condition which we call scorbutus.

Foods that increase the bowel function, such as vegetables, no doubt change the bacterial flora, lessening the number and virulency, thus improving the health and lessening the tendency to the deficiency diseases. Therefore the deficiency diseases may be caused by the inability of the individual to resist infections from the intestinal tract. The importance of an understanding of the bacterial flora of the intestines as influenced by diet is now quite as interesting to the investigator and research worker as the chemistry of the foods to determine the necessary kinds of food which will maintain health at a high level in the adult as well as the child.

Recently I had the pleasure of listening to a very interesting paper before the American Congress of Physicians held at Rochester, Minnesota, the first week in April, and two days later at the University of Minnesota. At our banquet at Rochester a paper was read by Dr. Bass of the Medical Department of Tulane University, New Orleans, who is connected with the School of Tropical Medicine which is considered the best in the United States.

For some time Dr. Bass has been carrying out some experimental research work in regard to the bacterial flora of the intestines by the use of the bacillus acidophilus. He has been able, by feeding this to human beings, to exclude all other bacteria to the extent of 95 per cent. That is a remarkable statement of the experiments he has carried on with the bacillus acidophilus. Up to the time Dr. Bass began his research work the experimental work was done upon white rats. It was first begun for the purpose of determining the importance of the bacillus bulgaricus. All the former investigations had been made upon rats by other investigators attempting to verify or disprove the theory of Metchnikoff that the feeding of Bulgarian bacillus would have this same effect and would thereby rid the alimentary tract of harmful bacteria and thereby improve the digestive metabolism and raise the resistance of the individual. Bass, unlike former investigators, carried out his investigation on the human being. The results substantiated the work done by other men upon rats, that the Bulgarian bacillus was without any benefit and that feeding both the human being and the animals did not decrease the bacterial flora in the intestines, nor were they able to find Bulgarian bacillus in the stools.

I believe that this knowledge placed in our hands of being able to sterilize the intestinal tract by changing the bacterial flora by the use of the bacillus acidophilus, will also enable us to treat some of our diseases in the future by the isolation of certain bacteria in the intestines. McCullom further refers to the kind of foods that permit of intestinal statis, particularly statis of the cecum, which has been shown by post-mortem to contain vast amounts of putrefactive bacteria, thereby infecting the blood stream.

On a meat diet the putrefactive organisms are the prevailing flora of the intestines, so that I believe that changing the intestinal flora by the feeding of these vitamins or vitamin-carrying foods has much to do with the cure of these diseases or their prevention.

In regard to rickets, it is one of the diseases best known to the medical profession, and yet little was known about it definitely

until a few years ago. Many things which seem to be almost truths today were not clearly understood a short time ago.

I have had the misfortune of having a case in my own home. While I was studying abroad it was our good fortune to have a child born in the family, the first in the family, and the mother was unable to nurse the child. All the milk fed to children in Europe is boiled milk, because cows are rarely fed on pastures, and most of them are tubercular, and on account of the common milk bearing diseases, this child was fed boiled milk. When we reached London, England, the baby was nine months old, and was put on Walker-Gordon milk, not boiled or pasteurized, which originated in Boston, and is what we call certified milk. In our travels in Vienna, Italy, and in Paris, the baby was being fed on boiled milk. This baby did not have any teeth until about the 16th or 18th month. After the teeth were sufficiently erupted there was a beautiful line of demarcation from the time the baby was fed upon boiled milk and the time it was fed on raw milk. This line of demarcation any one could observe, and even when the permanent teeth came there were still deficiencies because of that fact. Of course, every man in the medical profession and dental profession knows that today if a child is given a small amount of orange juice when fed upon pasteurized or boiled milk, no such trouble would arise. There is something in these vitamin-bearing foods that has its influence.

I stood at the elbow of Dr. Gardner for an hour while he was talking at the Mayo Clinic and I said to him, "Doctor, I understand you are removing all devitalized teeth. Is that so?" He replied, "No, we are not removing all devitalized teeth, but unless there are definite clinical symptoms, and unless the X-ray findings are such that we feel warranted in removing them, we do not do so." He told me, however, that they had not removed any devitalized teeth without being able to isolate the streptococcus hemolyticus by culture. So I believe that many of these deficiency diseases, and many of these conditions of the teeth, simply are due to lowered resistance, and that is an important thing so far as we are concerned as physicians and dentists.

Where there are two or more children in the family, one child sitting at the foot of the table with the mother may have one kind of teeth, while the other one that sits at the head of the table with the father may have another kind of teeth. I have under my care and treatment at the present time the only child in a family. The father, as far as he can remember, has always used bread, meat and potatoes for his diet. The mother refuses to eat any cereals; she refuses to drink any milk. She does not eat much, while the father eats three kinds of food. What a terrible time this poor child has had. It is sick two or three times every winter. When there is an epidemic of colds the child is always sick. It has had pneumonia once or twice. We physicians have to contend with such cases as this.

Another thing of great importance at the present time—and I have no doubt dentists have noticed it—is the vast amount of cane sugar consumed by children and even adults. The situation that is noticeably prevalent, of grocery stores and bakery shops selling soft drinks and confectionaries being located at a convenient corner adjacent to our public schools and high schools where the children indulge in all forms of cane sugar, eat quantities of candies and bakery products and drinks with syrup, constantly having the system saturated with an excess of sugar, thereby leaving no opportunity of inducing the child, poorly nourished or too fat, to eat a well-regulated diet. Cane sugar is easily digested. It is carried into the blood stream, and the protein substances which carry the vitamins are prevented from being taken up in the system.

In time we may probably know the vitamin which is concerned in the production of caries of the teeth. We want to know as dentists the kind of diet patients, as a rule, should eat, and as physicians we should advise our patients to partake of a general diet. There is no reason why members of a family cannot use a general diet. Some children do not use milk. They are not taught to eat vegetables, but they subsist largely on sweets, jams or jellies. The latter are the first things children want, instead of being taught to partake of a general diet.

Again, children should be taught to remain seated at the table until other members of the family have finished eating. I believe in the French system of serving meals in several portions, so that the child or children must remain seated at the table as long as the parents remain, so that they may be taught to eat a general diet. Milk, eggs, and leafy vegetables are protective foods. One kind of seed as well as another loses its protective properties when bolted. The value is enhanced by the grinding of the whole seed and using the food. It is now necessary, in comparing food values or arranging a diet that this is done biologically rather than by our former standard of the caloric value of foods.

P. G. Puterbaugh, Chicago: The essayist has shown that human teeth are only affected by the lack of vitamins in the diet during their formative period, that teeth that are fully developed are not directly affected by the lack of vitamins, except that it may change their environment. It may change the salivary condition and constituents; it may affect the bacterial flora of the mouth in such a manner that outside influences are brought to bear on

the teeth resulting in dental caries. But only in teeth of rodents in which we have constant growth do we have the absorption of tooth structure due to lack of vitamins.

In human teeth, as pointed out by Dr. Munson, we do have defective development in childhood, but we must remember that the defects occur only while the teeth are being formed.

Pickerill called attention to the fact that in order to maintain the best oral condition no meal is correctly balanced unless it be finished with a salad. Natives of the tropics who include citrus fruits as a chief part of their dietary have better teeth than people who consume large quantities of starches, white breads, etc. Rats and guinea pigs fed on a vitamin low diet or vitamin absent diet develop general metabolic disturbances indicative of malnutrition, including ulcerative and suppurative conditions about the mouth, and especially the structures supporting the teeth; but these conditions are not limited to their mouths, they have retograde metabolic changes throughout their entire bodies. Their hair gets coarse, they look scrawny, they develop xeropthalmia, the conjunctiva becomes congested and they get crusts about the eyelids; they are underweight, undernourished, and have bony changes which simulate rickets. A rickety child will develop and begin to walk normally, and after it has walked a few weeks or months it will suddenly refuse to walk or stand upon its feet. The ends of the long bones become tender, due to the inflammatory condition of the bone and absorption of osseous tissue. Rats on a vitamin free diet exhibit the same type of bony change, and that takes place in the jaws the same as it does in the long bones. We hear of typical examples of osseous inflammatory conditions which may not be due to bacterial invasion but due to autointoxication or to the toxin produced by certain chemical substances, due to errors in metabolism.

We must view the results of these experiments from a broad viewpoint and because rodents have teeth that absorb and whose investing tissues become involved in suppurative conditions along with general systemic changes, we must not assume that we have discovered the cause of pyorrhea alveolaris.

In reviewing the paper from a dental standpoint we must consider it a valuable addition to our knowledge in that we can apply it to patients who are suffering from malnutrition, many of the symptoms of which are diagnosable by changes within the oral cavity.

Dr. Hatton, (closing): It is true that McCollum at one stage of his study of the scurvy problem thought constipation was the important factor in the production of scurvy, and he stood out for a long time against the world on this proposition, and only yielded after repeating his experiments; he has now accepted the idea that there is an important vitamin factor in guinea pig scurvy.

There is no doubt of the fact that the liability to infection is increased as the result of vitamin deficiency and that bacteria play an important part in the production of such infections, but a more important factor from the present point of view is that of the resistance of the individual. That is what Dr. Black mentioned concerning the typhoid fever problem; we have increased the resistance of the individual against typhoid fever by vaccination. It is supposed that this resistance is comparably increased by a diet rich in vitamins.

With reference to Metchnikoff and sour milk, it is not the bacillus bulgaricus, but the vitamin content of the milk which produces longevity, according to present notions.

I am not particularly optimistic about this proposition. Dr. Vaughan before the Institute of Medicine in Chicago said that when he first studied the subject of tuberculosis and began to do research work (it was at the time when bacteriology was in its beginning) he ventured the assertion that tuberculosis would be wiped out in twenty-five years; a little later he put it at fifty years, and now, he said, at five hundred or more. I feel the same way about vitamins. We cannot rearrange the nation's dietary immediately, but I do know this: if we are not intelligent enough to eat what we ought to eat, nature will dispose of us, by eliminating our race from the earth by a process of natural selection.

ESSENTIALS IN THE TREATMENT AND CARE OF THE INVESTING STRUCTURES OF THE TEETH BEYOND THE PREVENTIVE STAGE

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TODAY the era of prevention in both medicine and dentistry is at hand. The proportionate number of cases is rapidly increasing, where preventive measures along the line of prophylaxis are working wonderful results in the elimination of the serious phases of dental operations and engineering replacements.

There are numerous forms and clinical manifestations of pyorrhea, and I use this term so generally known just in the way that one would use the word "fever," as a very general term, to bring to our minds one or more of the diseased conditions to which the investing structures of teeth are heir.

Before discussing abnormal conditions of investing structures, we shall be obliged to eliminate the question of non-vital or dead teeth, for we cannot expect to gain headway in the treatment of surrounding structures for the elimination of formative or productive areas of low-grade infection in the mouth, without first satisfying ourselves, as far as possible, that there are no foci of infection remaining at any of the non-vital root ends.

The extraction of devitalized teeth at the present time in view of rational ideas now held by the majority of men in the profession finally comes down to a question of common sense and good judgment.

The removal of infected devitalized teeth is not the first step in the march of treatment for the eradication of infection present in the structures surrounding the teeth, but the consideration of that procedure at this time gives us a premise to build on, which will be taken up again a little later, and brings us to the first step in the treatment of a case of advanced periodontoclasia or pyorrhea which presents.

The first essential is to eliminate from the system the field for production of low-grade infection in and about the processes of the maxilla and mandible. In attempting to do this we must have in mind the ophthalmic index or the state of health of the patient.

1. *Relation of the Physical Condition to the Local Manifestations.*—The first essential in the march of treatment is the consideration of the physical condition of one presenting with an advanced case, which usually means extensive bone destruction. The departure from normal in the appearance of the gum tissues and the destruction of bone has of course been made manifest through careful radiography and clinical examinations combined with a correct history of the case, two important aids in the consideration of this essential.

General treatments and diets will vary,

as for instance in the diabetic variety; where traumatism is the cause mechanical interference must remove the abnormal stress; but prophylaxis or surgical treatment as indicated is the foremost factor locally in successfully handling all varieties.

We cannot lay too much stress on the importance of a perfect set of films in these cases. He must study them carefully, and re-check them at different angles, the different density in different kinds of bone structure, various bony formations that throw shadows, and the foramina and canals that sometimes at a casual glance appear to be rarefied areas.

The periodontist should record a history in these cases as we deem it important for future reference and for our own records, but it does not need to be too technical, especially as we expect a more detailed report from the medical diagnostician. However, we should know and record the age, history of previous diseases and recent disabilities and symptoms, occupation, which is important as it has to do with the etiology of the disease and gives an idea of the conditions under which the patient is living, in regard to exposure and amounts of exercises taken; also what parts of the body are being exercised, whether occupation is principally physical or mental and whether food can be taken regularly, etc. Something on this plan, or a more elaborate history if desired, should be recorded.

2. *Nonvital Teeth.*—The patient then calls upon the diagnostician for a complete physical and systemic examination. With this report in hand we are ready to turn back to the question of nonvital teeth.

We believe even in a case showing normal or nearly normal findings that teeth with rarefied areas present as well as teeth with very little bone attachment which are loose, should come out. In short we should not attempt to save a tooth which is a menace to the patient's health. We should not consider root resection in these advanced cases, even of normal findings.

The non-vital teeth showing areas and the hopelessly loose one, having been dispensed with, the patient will wish to know what the prognosis is in his particular case. There is an occasional exception, but our answer to that question can safely depend on what in our judgment we can hope to accomplish locally with surgical or other treatments and upon the vitality of the part, which in a measure is the reflection of the whole general systemic condition. In this connection our records show cases of interest concerning the value of systemic examinations. The following are a few cases:

Case A: Young woman nineteen years old, presenting with results of X-ray and clinical findings, showing deep pyorrhea sinuses on mesio-buccal surfaces of upper molars, also on disto-lingual of another lower molar. There were no deposits of any kind, simply an infectious destruction of periosteum, peridental membrane and bone. The history was difficult to get, and was finally obtained from the mother. The physical condition was a large factor in this case, if not the whole reason for this destruction of bone, and was probably of the anemic type. Physical findings revealed conditions of myasthenia and neurosthenia, leucocytosis, secondary anemia with autointoxication, in fact, the girl had nearly lost the sight of one eye. After intensive medical treatment, during which period the mouth condition had been taken care of, the patient gained in weight back to nearly normal and unless there is a recurrence of the physical symptoms, there is little chance of the destruction of bone beyond the normal.

Case B: Woman of forty-five under

observation and local treatment about nine years, two teeth had been previously removed and local surgical treatment carried out. We were aware in this case, of gastrointestinal toxemia. Upon each return call for prophylactic care, about every three or four months, case always revealed gingival inflammations, sometimes infectious and large amounts of calcareous deposits. This case was despaired of and an attempt was made a great number of times to get the systemic findings, but without success. Finally, an acute gall-bladder attack necessitated an operation. Patient was not seen until nearly six months after same and the change in the condition of the gums was marvelous. Simple prophylactic treatments every four months are now keeping the mouth in healthy, normal condition; in fact, it would hardly be believable that it was the same case.

Case C: Woman of forty-five presented case in which X-rays showed extensive destruction of bone. Clinical examination revealed suppurative condition of gum tissue, periodontal membrane, periosteum and bone. Deep bluish color marked the location of sinuses. Local loss of tone very marked. Operation few years previous, and case was delayed for physical examination; urine, very fair; blood pressure, all right; heart and lungs, negative; no hemorrhoids; neurotic and history showed nervous exhaustion; tonsils had been removed, slight catarrhal condition pharynx and naries; postpharyngeal membrane lacked muscle tone; uterus, convex, almost obliterated from retraction; history of an ovariectomy complete on one side. Patient showed number of other technical complications, but this was the seat of a large amount of low-grade infection and if not the cause of the mouth condition, it had a strong effect on the vitality of the part.

Case D: Woman of forty-eight, one of the cases that taught us the advisability of clinical examinations, apparently was of the auto-intoxication and constipation type systemically. Mouth was thoroughly treated surgically and prophylactically, but we were absolutely unable to get the gums in any condition of health which would last for more than two weeks. Inflammations would always reoccur accompanied sometimes with infections, and fungous growth interproximally on the gingival margins. At the time this case was in our hands we did not have a very good history as an attempt to obtain a physical examination failed. Suddenly the woman had a stroke of paralysis and was removed to a sanitarium. We have no record of the systemic abnormality, but wish to stress the futility of local treatments alone in a case of this nature.

Case E: Young woman of twenty-four, mild case of gingivitis with acute inflammation. Gave history of failure to respond to vapor treatments, constipation and mild attacks of indigestion. Prophylaxis failed to bring desired results until physical examination revealed the necessity of tonic and diets and increased water intake. Within a short time the local inflammations began to subside and the mouth will retain its good condition unless the patient is careless and allows the general symptoms to return, at which times the recurrence of the local condition is noticeable; but it is less noticeable each time as the vitality of the investing structures is improving from both local and systemic measures.

Case F: Woman of fifty has been in our care about ten years; there is great difficulty to maintain gum tissue in state of health and keep teeth clear of deposits. Patient simply refused to have physical examination but was willing to call every month for prophylactic work. Finally suffered an attack of hemorrhoids

and had same surgically treated. Within a month's time improvement in condition of mouth was very marked. We feel sure that had we been insistent enough about getting physical findings in this case some years ago, we would have saved a large amount of trouble and have been spared much of worry.

In citing these cases, I do not wish to be understood as assuming that all the local abnormalities in these cases were the result of the general systemic condition, but from our clinical experience it must be concluded that it is wise to have more in mind than just the local manifestations in treating these cases.

3. *Pre-treatment.*—We will take as an example a case where the color of the gum is an abnormal dark red or verging on bluish in the locations of deep sinuses, with or without marginal inflammations. Radiographs show considerable amount of bone destruction and either serumy pus or bacteria charged serum, or the heavier varieties of pus, with visible deposits or apparently little. Whatever the variety or form of manifestation or whatever nomenclature one may care to use in describing it, the local treatment is similar except perhaps in its intensity.

Here one may make use of laboratory tests to ascertain which forms of bacteria are present locally. In the large number of bacteria present at times in the mouth flora, we have probably to deal more especially in these cases with the different forms of staphylococcus and streptococcus, unless we are dealing with Vincent's disease, which we will not consider at this time. The internist may deem an autogenous vaccine advisable in a case showing streptococcus infection in the blood stream and one should know how to prepare and preserve a smear or specimen, a fact which emphasizes the cooperation between the diagnostician and the dentist. The pre-treatment varies only in its duration for different cases as follows:

The mouth is sprayed with a strong antiseptic and the visible calcareous deposits removed with a cursory scaling. The teeth are then cleaned with an engine brush or scrubbed with a toothbrush in the hands of the operator. We then subject the mouth to a massage suction treatment, using suction cups for the purpose of draining and cleansing the pockets and in a measure emptying the gorged blood vessels. This is done twice or three times a week for from two to three weeks. Our object in this treatment is to produce hyperemia and to revitalize the parts. The toothbrush in the hands of the operator, carefully scrubbing and rotating the brush against the gums at each visit of the patient, appears to give good results, although the suction produces deeper stimulation.

Before starting our surgical work at this time, it is well to scan the occlusion. By laying the finger along the buccal or labial surfaces of the teeth, any tooth that strikes hard enough to produce serious trauma can be detected by moving the jaws laterally with the teeth in occlusion. These should be ground, and the continuity of the grinding and cutting surfaces kept in mind with the idea of completing this operation when the surgical work has been finished.

After each suction treatment, a medicament is used.

4. *Instrumentation.*—We are dealing with advanced cases and we shall consider the use of instruments in that light more than from the standpoint of simple prophylactic work.

A small locality of from two to four teeth having been selected as our field of operation, we start with one of a set of four "push and pull" scalers. The other three are bent to about the angle of the greater curve and these four will reach

any surface of any tooth in the mouth comfortably. These instruments are for the rough work and are also very useful for subsequent prophylactic work. Next we go between the approximal surfaces with a scaler formed like a scimitar, that will often catch particles missed with the others. Then the planes with which all the surfaces are reached down to the bottom of the pockets, thoroughly but carefully; it should be remembered that they are planes and should be used in general parallel to the long axis of the tooth. It is best to prove up the work with a pair of files, which cover every surface of practically every tooth in the mouth. They will detect any little particle of deposit or roughness left and are also used in the bottom of the sinuses and along the rough edges of the process as curettes, smoothing the bone and dislodging the germ nests. With this operation we also dislodge the lateral cysts which are so often found.

This method has appeared to bring results unobtainable from just planing and polishing the tooth surfaces. The instrumentation is finished by carefully going over all surfaces under the gum margin and a short distance above with files, whose surfaces are not too rough; they should be used more as burnishers. Files which have been used seem to answer the purpose admirably. Gum resection is sometimes necessary, especially between the posterior teeth. Experience has taught that we can save more gum substance by constant stimulation which builds up attachment and bone structure from below. Where the fibrous gum tissue is too loose or thick to be overcome by this treatment, it can be burned down a number of times with phenol sulphonic acid, applied with cotton wound on a treatment point, until the part is hard and firm.

Following this comes the polishing which can be done with disks, strips, tape, moose hide wheels, points of wood and other materials used with fine abrasive, but one should be cautioned against too free use of stones. The least cutting of the tooth surface possible which leaves a smooth surface tends to minimize the bugbear of sensitiveness.

5. *Occlusion.*—We return again to occlusion and contact points. The teeth must rock in occlusion without any undue stress on any one or a few teeth. Enough time spent with wax articulating paper, and stones with the thought in mind of the continuity of the tooth grinding and cutting surfaces, will produce good results. The important thing is to watch carefully as the years pass, and detect before any damage is done, any tooth that may again be striking too hard. Our rule is always to try the occlusion in pyorrhea mouths returning for subsequent prophylactic work. The value of proper contact points is well understood and only needs to be mentioned in passing.

6. *Post-Treatment, or After-Care by the Operator*—The patient is required to call once or twice a week for at least a month, sometimes for a much longer time, for stimulation treatments, which are given by the dental assistant and consist of suction treatments, followed by gently wood-sticking against the gums or slightly under them. This treatment was discovered to be of value, accidentally, in treating sensitive teeth, and for such teeth we know of no better treatment than wood-sticking with zinc iodide, or, in severe cases, coating with solution of tincture of benzoin and tannic acid, mixed into a thick paste and applied after drying the tooth surface and allowed to stand free from moisture for at least five minutes.

Formula for zinc iodide solution: zinc iodide, 15 parts; water, 10 parts; iodin, 25 parts; glycerine, 50 parts.

In treating some very sensitive teeth around which there had been deep pockets by rubbing every few days with zinc iodide, it was very noticeable that there was a rapid improvement in the structure and appearance of the gums, so much so that the treatment was tried in cases where there was no sensitiveness, with good results, and is now included in our regular treatment.

7. *Care by the Patient at Home.*—As the patient returns for these stimulating treatments, his education as to the home care is undertaken. First the brushing is described and illustrated. Methods of forcing the bristles between the teeth with a slight rotary motion can be recommended, especially where there are good approximal spaces. The sweeping motion brushing the whole surface of gum tissue and tooth surface toward cutting edge and the circular method in different hands all seem to produce the desired results. Massage produced by placing the tip of the forefinger interproximally at the gum margin and allowing the finger at point of contact to move slightly, rotating the hand through a much larger arc, all around the mouth, inside and out, is a fine massage for bone and tissue building. We insist, though, upon our patients finishing the cleaning operations with the use of wide dental floss charged with a slight abrasive, and we attempt to teach just as definite technic in the use of the floss as we use in the instrumentation. The bottle containing floss is held in the right hand, 10 or 12 inches of the floss being drawn out. The loose end is held in the left hand and drawn around the third and fourth fingers of same hand. Then it is drawn across the end of the thumb and index finger or around the index finger and over the end of second finger, depending upon what particular place in the mouth it is to be used. With the right hand containing the bottle, the floss is wound around index finger until only about ½ or ¾ of an inch separates the finger of the right hand from finger or thumb of left hand. The floss is changed from index finger of right hand to thumb depending also on where it is to be used. We are ready for application in the mouth.

We start on left upper and keep fingers or thumbs inside cheeks, back of last tooth, then between molars, etc., cleaning and polishing the distal of the mesial tooth and the mesial of the distal, then moving the floss mesially and distally across the interproximal gum tissues. There can be no possible harm done if the contact points are left so that the floss will go through snugly but easily. If the fingers are kept about the distance apart that the teeth are wide it is almost impossible to strike down on gums. Under bridges a short curved bodkin thru the eye of which the floss is threaded, is used.

This method has given gratifying results. The patient is taught the correct technic and then given floss to take home. At the next visit any errors that might have occurred in its use at home are corrected. We advise the patient to stand in front of a mirror in order to see what he is doing in brushing and in the use of the floss.

Finally one of the most vital points in the permanency of the results which we have obtained in these cases of advanced pyorrhea conditions is the regularity with which the patients return for prophylaxis. With proper care on our part and with conscientious attention given at home, there is a steady improvement.

Summary

1. The Relation of the Physical Condition to the Local Manifestations can be summed up in closer relation between the medical diagnostician and the den-

tist, as it is in conjunction with him that we are attempting to eliminate fields for the production of low-grade infection. The mouth is not the only field for production and the local condition may be seriously influenced by other physical ailments.

2. Any nonvital teeth that are a menace to the patient's health should be sacrificed. Some sinuses of an apparent pyorrhea nature have their origin in infected root ends.

3. Pre-treatment. The tissues should be put into a revitalized state before instrumentation is attempted.

4. Instrumentation includes a definite technic and mode of procedure; gum resection should be resorted to just as little as possible.

5. Occlusion. A very important essential and one, which if neglected, will doom to failure the most care-taking application of the other essentials.

6. Post-treatment or After Care by the Operator. Cases should not be pronounced finished until the operator is sure that the surrounding tissues show no inflammation and are hard and firm.

7. Care by the Patient at Home. No matter how well the periodontist has performed his work the case should not only stay in the condition in which it was discharged, but it should improve as the years pass, providing this important essential is painstakingly performed by the patient.

Discussion

Justin D. Towner, Memphis, Tennessee: I wish to emphasize first of all the importance and the necessity of an examination, both local and physical. We must remember that no examination is complete without inquiring into the case history of the patient, for that is the only means we have of getting any idea of a difficult pathology. It is not necessary to go into the details of the local or physical examination, but that very few dentists are competent, either professionally or legally, to make a physical examination or to render proper judgment in that particular. Therefore, we must depend upon our medical brother and all such cases should be referred to the internist or proper diagnostician.

Diagnosis comes next, for an accurate diagnosis is essential for careful and efficient treatment.

The next requisite is the pre-treatment. That is very essential. I differ with the essayist's opinion in that I begin on the occlusion. Granting that the case belongs to the periodontists, I begin on the occlusal surface and the first thing is to remove traumatic occlusion, or any defect of occlusion that is influencing the disease.

The next step is to thoroughly treat and cleanse the crowns of the teeth, for that is presurgical. There are certain requisites in all cases and certainly thorough cleansing is necessary to remove infection before any proper surgical interference can take place. I must impress upon you the necessity of standardization of your procedure, whether it is your own or that of someone else. The cutting edge of the files and scalers comes off at a right angle, because in some instruments there is almost a millimeter between the cutting edge and the end of the instrument and you cannot get to the bottom of your pocket. You have to go under if you are going to remove the disease.

Dr. Weaver has a fifth prerequisite, occlusion. I advocate it as the first step in the treatment of local disease because it has that much power and assumes that much importance in the treatment of trouble. The post-treatment is very essential.

The trouble with periodontists today is this: they assume too much responsibility for cure. Three factors enter into this: one is the physical resistance or vitality of the patient. First the vital resistance, next the personal care taken of the mouth and, third, the periodontal treatment. If that is true, we cannot rightly assume more than one-third of the responsibility for the care of any case we treat.

The essayist's conclusion is very well taken. All work is only incidental to health and if you chose to say that it is incidental to the health of local conditions, then it must have a bearing on the physical condition because the oral cavity has such a large bearing on the physical make-up, whether in health or disease.

A. F. Isham, Buffalo, New York: I have been using this method of cleaning teeth in my own mouth for ten years. Previous to that time I saw a prescription in one of the magazines, of which the only gritty constituent is chalk. My method is to use this tooth powder and then before I rinse my mouth I take the tape and go between the teeth. Something has occurred in my mouth. I can take a quill toothpick and go between all the teeth. I do not know whether this is only the normal con-

dition due to advancing age or whether I have worn them off from the cleansing. I wonder if there are any other cases similar to mine.

H. J. Leonard, Minneapolis, Minnesota: I was particularly delighted with the case mentioned in which the factors had been traced back to those that had caused the lowered resistance on the part of the patient. They cannot always be traced.

The simplest method that we can use to raise the resistance of the tissues and to reduce the irritation is the one we should select. We want to use the least amount of time in treating our patients. We want to treat the largest number of patients and any method that involves a greater number of steps than is absolutely necessary should be abandoned. I take exception to the methods of pre-treatment, methods which have to have a considerable amount of time spent on them, because I feel they are not necessary to get the results we should expect. In teaching periodontia to students where we want a large number of men to do the work after they graduate, at least in its simpler aspects, we have to eliminate all unnecessary steps. I feel that we as periodontists should make great effort to discourage the use of medicaments which take unnecessary time to apply and whose value seems at best doubtful.

Dr. Weaver (closing): In these advanced cases I consider it absolutely necessary that the patient has a thorough physical examination before the local operations are attempted.

We are also finding that there are two classes of physicians, those who are treating people who are very sick and confined to their bed, and the class who are doing preventive work, by attending people who are up. It is the latter class that we are attempting in the main, to deal with. The diagnostician also is beginning to thank the periodontists for the strong influence on patients in their hands toward preventive work along medical lines.

In regard to low-grade infection there are a number of localities for the formation of these infections, as the teeth, the cranial sinuses, the digestive tract, the prostate gland, genito-urinary organs, etc. We must remember that the teeth are not the only source of low-grade infection.

In regard to occlusion: the first thing done is to scan the occlusion and do the rough work, to the extent that there are not one, two or more teeth which are pounding entirely too hard.

I want to impress the importance of curetting the diseased soft edges of the surrounding alveolar process and soft tissues, as it is difficult to believe what will be dug out at times, in the way of diseased bone, lateral cysts, etc.

In regard to Dr. Isham's question about the dental floss: I have been using the floss in the way I have described for about five years and I have noticed in a good many instances and in my own mouth that what he speaks of happens. We all are growing old and owing to the lowered vitality in other parts of the body as well as in the mouth, the bony structure around the teeth begins to deteriorate. As these structures are transitory structures and are end organs, naturally they sometimes deteriorate quite early in life. Using the dental floss regularly seems to harden the tissue and keep it in closer conjunction with the bone and as the bone is absorbed, this massage causes the tissues to follow it down, making more interproximal spaces between the teeth.

In regard to Dr. Leonard's remark concerning too much pre-treatment: it must be remembered that I am discussing serious advanced periodontal cases and personally, I consider this work very important in these serious cases of long standing, because the local resistance is very much lowered and the healing process takes place so much more rapidly when these tissues have been in a measure, revitalized before surgical work is commenced.

OFFICE EFFICIENCY AND DENTAL ASSISTANTS

By C. N. JOHNSON, M.A., L.D.S., D.D.S., M.D.S., F.A.C.D., Chicago, Illinois

(Read before the joint meeting of the State Dental Societies of Missouri, Kansas, and Oklahoma, at Kansas City, Missouri, April 12, 1922)

MUCH has been written in recent years about the business management of a dental practice, but it has largely drifted into a consideration of fees, and the most effective methods of getting more money out of the people. If greater emphasis had been placed on increasing the efficiency of the operator himself, and making it possible for him to render a wider and wider range of service, the results would have been more gratifying, and less open to the severe strictures which have been passed upon them. This paper is not intended essentially to deal with the consideration of fees, and yet this much may legitimately be said that the coupling of the subject of office efficiency with that of fees in the manner in which it has been done, has tended more to the fostering of a mercenary spirit in the dental profession than to the laudable growth of a better service to the poeple. It has too frequently led to such an outrageous profiteering as to threaten to drag the good name of dentistry into the mire and make it a byword in the land. More and more the fundamental lesson must be learned by dentists that any plan of managing a practice which does not take into account the point of view of the patient as well as that of the dentist cannot long endure.

It is not intended to convey the idea that better fees should not obtain in the profession than have been quite generally charged in the past. Considering the nature of the service rendered, and the exacting character of the work, dental fees have for the most part been too low; but before they can be raised to their legitimate level there must first be realized the profoundest conviction on the part of the patient, as well as the dentist, that the service is worthy of the fee, and that for every dollar exacted, there must be in return a commensurate amount of benefit and resultant comfort to the patient. And in another analysis of the situation the raising of fees applies only to those who can afford to pay good fees, and not to a large mass of the people who need dental service, but who also need with greater insistence the bare necessities of life. If, as we believe, the maintenance of the mouth and teeth in a condition of health is an important factor in bodily welfare, then the service which brings this about should be extended as widely as possible. If it is true that those who can afford to pay good fees should be taught to pay them graciously and gladly, it is also true that those who need the service but cannot afford to pay high fees should have the benefit of the service at a fee commensurate with their purse.

The problem of meeting the needs of the masses as well as the classes is one which is today engaging the attention of the best minds in the profession. It is one not easy of solution, but it, with others of our social problems, will eventually be worked out to the betterment of the entire body politic. Meanwhile each member of the profession may do his

share in meeting the situation in his own circle, and thus extend in an ever-increasing ratio a beneficent influence toward the common end in view. He can do this by increasing the efficiency of his own efforts and thus making it possible to care for a wider range of patients and enlarging upon his sphere of usefulness in a broadened service to the people. Too frequently dentists in the past have conducted their affairs in such a slip-shod manner that they have failed to render the greatest and best possible service to the patient, or to reap the financial reward to which they were justly entitled. In this age of intensive application in the affairs of men, it will not do for the professional man to ignore the signs of the times and blindly refuse to take advantage of methods by which he may logically increase his professional output and reap the relative rewards. Time spent in systematizing one's daily practice so as to accomplish the best results is just as important as it is to study the technical details of our work. Probably no man can conduct a full practice without encountering situations which entail more or less stress, owing to the emergencies which arise unexpectedly, but the stress may be greatly minimized by establishing system and precision in the affairs of the office, and by bringing order out of what otherwise would be chaos.

In conducting a practice, the question always arises as to whether the operator should charge by the hour or by the operation. Much has been said pro and con on the subject and much may logically be said. There are certain phases of our work in which the fee cannot equitably be governed wholly by the operation, and others where time is not the only consideration. One operation must of necessity cost more than another for various reasons, one of which is the greater length of time required to perform it. But time is not the only factor which enters into the consideration. One operation may be more difficult than another, and may demand much greater skill and a larger expenditure of energy. Not only this, but there are times when the operator can accomplish very much more in a given hour than he can in another, no matter how evenly his efforts may run. Then again, to work solely by the hour imposes on the operator the necessity of watching the clock very carefully, and counting not only the hours, but in some instances, even the minutes. This is not conducive to the closest application to the case in hand, and is quite likely to make of him a time server in the strictest sense of the word. What then shall be the equitable basis for estimating fees? Surely it shall be a combination of both methods, account being taken not only of the time consumed, but of the character and extent of the operation. On this plan alone can adequate fees be obtained for all of our operations without the development of occasional friction between patient and practitioner. Each operator must work out this question to suit his own requirements, with the idea in mind of utilizing his energies to the best and most profitable advantage, at the same time that he protects the interests of, and gives the greatest satisfaction to, his patients.

And now to the main theme of the present paper, How best shall an operator employ his time and energies in conducting a dental practice? The greatest enemy to the profitable employment of time in most offices is the lack of system. Doing things in a slip-shod, haphazard way is wasteful both of energy and money, and the first thing for every operator to do is to so systematize his time and his methods of work that he can accomplish the most in the course of the day, week, or month, with the least expenditure of nervous and muscular energy. It remains for each practitioner to outline his own system and formulate his own schedule, because the varying conditions existing in different localities must be taken into consideration. One man in a large town or city may work, for the most part, with patients who do not come great distances,

and he can arrange his appointments to fit into the most profitable employment of his time, because of the ready access of his patients to his office; while another man may have patients coming from great distances, and must of necessity arrange for long appointments to accomplish the greatest possible service for them at each sitting. Such matters as these must be planned according to conditions, but always they should be so arranged as to get the maximum of accomplishment out of the minimum of time. If a man finds that he is not getting a profitable return from the amount of time expended there is something wrong with his methods, and he should set himself the task of revising them Frequently he will find that this revision does not so much involve the raising of his fees as it does the more effective utilization of his time. The dominant idea should be to accomplish the widest range of service consistent with the performance of good work, and to this end every process of his operations should be analyzed to see wherein needless detail may be eliminated and legitimate short cuts be taken advantage of. This does not imply that the closest attention to detail is not necessary, or that short cuts are not sometimes dangerous. It is not a plea for slighting in the smallest possible degree the essentials of any operation, but it has been demonstrated in other lines of effort that with many of the technical processes it has been found possible to eliminate a relatively large per cent of the movements without in the least affecting the perfection of the finished product. In the familiar process of laying brick, for instance, it was found on analysis that many more movements were employed than were necessary, and when this process was properly systematized it resulted in the possibility of a man laying many more bricks in a given time than had formerly been done without the expenditure of any more energy. When this was published it impressed me with its possible application to dental operations, and the idea is commended to the careful study of every practitioner. With most dentists there are many false and unnecessary notions, the limitation of which will result in the saving of much time, and the performance of the work with greater ease and facility.

Manifestly this is something which must be worked out by each operator for himself, for the reason that few of our operations are routine in the sense that is bricklaying; but it is confidently believed that a close study of this matter in each individual office will result in a great saving of time, and a very much wider range of efficient service. It must be noticeable to any observer that there is a decided difference in the facility with which different operators perform their work, and this must inevitably obtain, owing to the varying native ability of men in the execution of technical processes; and yet there is no operator so perfect, neither is there any operator so deficient, that his work cannot be greatly improved by applying the principles just indicated to everyday procedures.

With an audience of this character, it is deemed unnecessary to go into the detail of keeping books or records or outlining the clerical methods to be used in conducting a practice; but a brief reference may be made to the matter of appointments as it affects our efficiency. Unless conditions exist, such as have just been indicated, where patients are obliged to come great distances, it should be the policy to make relatively short sittings. There are several advantages in doing this. First, there is less tension on the patient in a short sitting than in a long one; second, there is greater likelihood of the patient being promptly on time when it is understood that only a limited period is set aside for each individual; and third, it tends to precision on the part of the operator and the performance of operations in the most expeditious manner—in other words, the elimination of false notions. It encourages concentra-

tion, which is a necessary adjunct, not only in the performance of work quickly but in the performance of work thoroughly; it does away with the tendency to stop and talk; it puts a premium on the value of time, which should be one of the cardinal tenets in conducting a dental practice. In short, it keys the operator up to the best there is in him, and emphasizes the fact that the office is a place for the accomplishment of results. Then again, if appointments are short, the exigency of a broken appointment, which will occur at times in the most methodical practice, is not so serious a matter, and does not entail so great a loss on the operator or the patient as would a long sitting. In most of our technical procedures today any given step in the operation may be performed without the extended sittings which prevailed at one time when large complex fillings with gold foil were the established routine of the day. There are, of course, arguments on the other side in favor of long sittings, but all in all the best interests of both patient and operator in a busy practice can be conserved by making short appointments.

The subject of efficiency could not well be considered without including the subject of assistants. It is, of course, taken for granted that in this connection the young lady assistant is meant. One could not conceive of efficiency in a dental office without the help of a young lady, any more than one could imagine a physician carrying a patient through a critical illness without a trained nurse. The young lady assistant has become such an integral part of our everyday practice, and has done so much to relieve the burdens of the dentist that she is deserving of a large niche in the dental hall of fame. She can do so well many of the things that the dentist cannot do himself, and she can do so much better than he many of the things he attempts, that it is high time in our professional progress that she should be given her proper status and come into the full recognition which her merits so justly demand. In recent years her standing in the profession has immeasurably advanced, until now she is part and parcel of every well organized and efficient dental office.

It may be well to point out briefly some of the qualifications deemed desirable in an assistant, and also to indicate a few of the many ways in which she may make herself valuable in helping to conduct a practice. Without equivocation the very first requisite in an assistant should be that of loyalty—loyalty to her employer, to the profession of dentistry, and to her particular connection with it. Unless a young lady can wholeheartedly give her best efforts to her employer, and be able to work at all times for his interests, and also to defend enthusiastically the fair name of dentistry, she would far better select some other calling. She will never succeed in assisting a practitioner in the most effective manner or making herself valuable to him without loyalty nor will she get the satisfaction out of her service that should come to every conscientious worker in any line of effort. She should take the utmost pride in her work, raising it to the dignity of an exalted calling; and impressing upon all with whom she comes in contact—not, of course, by word of mouth so much as by her bearing and general attitude toward her occupation—that to be an assistant in a dental office is among the finest, the most useful, and most desirable of all pursuits for a young lady. She should by her demeanor place it on a par with that of the trained nurse, a calling which next to the practice of medicine itself has commanded our respect and admiration from the days of the immortal Florence Nightingale on down to the present time. To be permitted to minister to human welfare in anything so direct and tangible as this, should be considered a rare privilege, and any young lady who fails to appreciate this aspect of her work will fall far short of getting the most out of the situation.

Another requisite for the greatest effi-

ciency in a dental assistant is that intangible and yet very important quality called intuition. Nowhere in human relationship is this more needed than in a dental practice. To be able to intuitively read human nature like an open book is a great asset in dealing with people in the intimate relationship existing in a dental office, and every young lady who aspires to assist a dentist should study humanity as a science, and be able to read the motives, and even the intentions, of people so as to anticipate and ward off unpleasant situations. A quick witted, intelligent girl can often do more than the dentist himself in making the machinery of an office run smoothly. To harmonize all the varying interests of different kinds of people and send them out of the office in a gracious mood is no small achievement, and yet the right sort of young lady can do this as can no other agency.

The chief concomitant of intuition is tact, and in no relation of life is it more needed than in this. What a joy to the dentist is a young lady who stands between him and all those petty little annoyances, which are so prone to creep into the experiences of everyday practice. It leaves him free to concentrate on the problem of giving better and still better service, and attending without distraction to the many technical procedures, which enter so largely into his daily work. Such a girl is priceless.

There is one phase of the relationship between the dentist and his assistant, which needs a frank statement and a clear understanding. In most relations of life the common courtesy of cultured society demands that the man shall step aside at all times and give the lady the right of way. We pride ourselves, and justly so, on our innate gallantry and condescension to the fair sex. It is a mark of our most advanced civilization that we accord to woman the distinction of always coming first. A man is considered lacking in ordinary decency who fails to conform to this tenet. But in a dental office where efficiency is the supreme consideration, and where the practitioner's time is the most important factor in achievement, the common rules of society are reversed so far as precedence is concerned between operator and assistant. In other words, the operator's convenience should be considered always, and the assistant should step aside and keep out of his way, so as not to impede his slightest move. If he chances to reach for an instrument in a drawer at the same moment that she is replacing other instruments in this drawer, she should instantly withdraw and aid him to secure the instrument in the shortest possible time. If she stands on her established feminine rights by first replacing the instruments and compelling him to wait for even an instant she has not only robbed him of that instant, but has interfered with the rhythm of the operation, and interjected a disturbing influence which detracts from the greatest possible efficiency. She should be alert every moment to see wherein she can facilitate the work by keeping out of the operator's way, and having everything he uses at his finger's ends. If a young lady is disposed to take advantage of the common usages of the day as to feminine procedure, she has no place in a dental office.

In all of this there is not involved the slightest intention of discourtesy or the lowering in any degree of the high respect, which the operator should have for his assistant. It is merely that in conducting a modern dental practice with the necessity of achieving the most in the shortest possible time, everything must be made subservient to speed and efficiency, and it so happens that the time of the operator is the most important consideration in obtaining results, and, therefore, the operator must have the right of way. The young lady who wishes to make the most of her situation will study this feature of her service with the greatest care, and she will find that at the end of each day she has saved her employer

much valuable time and conduced to his wider usefulness.

Another requisite in a lady assistant should be alertness—the capacity for knowing precisely what instruments or appliance the dentist is next to use, and having it ready for instant service. An assistant who needs to be told by the operator to do the routine things of the office whenever a patient takes his chair, has no place in that office. The ordinary operations should move along smoothly without a word passing between the assistant and operator. In fact, in many instances, her quickness of wit will suggest many ways in which the work may be facilitated and made easier for the operator as well as for the patient and the assistant herself. A woman's intuition is keener than that of a man, and intuition is needed in every dental office, as has just been indicated.

But the relationship between dentist and assistant should not be all one-sided. For this splendid loyalty, intuition and tact on her part that we have referred to, there must be on his part a keen and vital interest in her welfare. He should do all in his power to advance her fortunes and conserve her happiness, guarding well her health, and looking to her future prospects with as much concern as if she were a member of his own household. There should be in his mind the thought that after she has served him faithfully and to the best of her ability, he will never see her want even though the obligation should be extended on into years and years of disability and misfortune. Every young lady assistant should be made to feel that the dentist's interest in her does not begin and end in the service she renders him, or in the material advantage which she brings to his practice. More and more, as the tenure of her service lengthens, there should develop on his part a sense of the obligation he owes for her fidelity and devotion to duty, and he should not be slow to prove to her that her interest in the affairs of the office is secondary to his own.

With this kind of a sentiment fostered between practitioner and assistant, the whole atmosphere of the dental office will take on a new illumination, and there will result an ever increasing efficiency, which will be advantageous alike to the dentist, to the assistant, and to the people they are called upon to serve.

FIFTY YEARS OF ROOT-CANAL FILLINGS

By EDMUND NOYES, D.D.S., Chicago, Illinois

(Read before the Illinois State Dental Society, Springfield, Illinois, May 9-11, 1922)

THE motive that has inspired this paper has been the hope that a clinical experience of more than fifty years in the treatment and filling of pulp canals in teeth and the retention of such teeth in the mouth may help a little toward bringing to a complete end the craze (now happily on the wane), for removing every tooth which has lost its pulp.

For fifty years dentists have observed occasionally some causative relation of diseases of the teeth to manifestations of trouble elsewhere. These were chiefly complaints of reflex or sympathetic pain about the face or in the eye or ear, sometimes in the shoulder or arm, which disappeared when the offending tooth was cured or removed. Sometimes more remote and more serious conditions were thought to be aggravated by bad mouth conditions, but generally the dental profession gave little attention to any of these matters except in response to complaints of pain, and the medical profession appear to have had no knowledge of them, if we may judge by the number of cases of reflex or sympathetic pains and neuralgias treated for a long time by physicians without making any inquiry into the condition of the teeth that were causing the trouble.

After the relation of infections about the teeth to important and sometimes fatal infections elsewhere was scientifically demonstrated, there was a rather sudden awakening of the medical profession to the importance of mouth conditions, and a great increase of interest and attention to them in the dental profession. There has followed the gradual development in the medical, and to a less extent in the dental profession, of the craze referred to above, for the extraction of all pulpless teeth. This craze has been greatly promoted and encouraged, especially in the medical profession by the unfortunate use for a long time by the dental profession of the term "dead teeth," a term that should never have been tolerated for a moment. A tooth is not dead so long as its periodontal membrane retains vital connection to its alveolus.

In the past fifty years a good many fads have been followed for a time by the dental profession but there has never before been a fad half so injurious and destructive as this for extraction of all pulpless teeth, and the closely related fad for the "surgical extraction of teeth." This latter may be admitted to be necessary in a few cases, perhaps one or two, possibly four or five in a thousand, but it is a crime to make these few cases the excuse for hundreds of expensive and sometimes dangerous operations that are not necessary.

I do not know much about the fads of the medical profession. The worst aspect of this one is the disposition of some physicians to go outside of their own field and give orders to dentists. I will say nothing more on this point for I have never experienced anything of that sort

myself. Physicians have sent patients to me with a request that I would see if I could find anything in the mouth that might account for troubles they were trying to overcome, but always in a way of fair and reasonable consultation.

Before describing in detail about one hundred and seventy-five teeth in which I have filled the roots for patients whom I have been able to see and have X-rays made in the past six months, it may be of some interest to say something, briefly, about root-canal filling in a general way.

Probably such operations were not made very commonly fifty or sixty years ago, but I am convinced that they became common very soon after that. I will use some information obtained from a paper by Dr. A. D. Black on alveolar abscess, read before the Ohio State Society in 1907, published in the *Dental Summary* in June and July, 1908. He says: "In the Cosmos, Vol. III, 1861-62, page 556, there is reported a case in which Dr. Hudson of Philadelphia had filled the root canals of the upper centrals with gold about 1830 and they were in perfect condition at the time of the report." In the *News Letter,* Vol. X, 1856-7, page 4, Dr. J. S. Clark of New Orleans is quoted as saying that he had "practiced fang filling with gold for the past nine or ten years." He said the profession knew how far Koecker had carried his operations in this direction, and "Maynard, Harwood, Badger, and Hudson practiced it years before any of us." In the same volume, page 234, Drs. Spaulding, Taft, Watt and others report success with gold as a root-filling. Possibly these reports imply a more general practice of filling roots in the first half of the last century than I suppose. It is my belief that such operations were made only by a very few of the best and most progressive operators and probably they were almost entirely limited to the upper front teeth.

Dr. Black's paper was about alveolar abscess and referred only incidentally to the filling of root canals. After quoting from a considerable number he says: "The articles mentioned, together with those of the succeeding ten years, indicate that the treatment of pulps was not seriously undertaken by the profession previous to 1865, and that after 1870 the attempts to save teeth with exposed living pulps, or with dead pulps, became quite common practice, the method generally employed being the removal of the contents of the canal and placing of from one to many treatments of creosote on cotton, most operators leaving such a treatment as a root filling. Quite a number of the better operators used gold foil for root filling, as mentioned in the references above. The first mention I found of a gutta-percha root filling was in the *Cosmos,* Vol. XIV, 1872, page 371, in an article by Dr. Oscar Doyle, of Louisville, Ky."

I am surprised that no one wrote about filling pulp canals with gutta-percha before 1872. A little history personally known to me will explain why. When I entered the office of Dr. E. L. Clarke, in Dubuque, Iowa, as a student, in May, 1865, he was filling the roots of teeth with base-plate gutta-percha, which, as I remember, was the identical material that we know by that name now. His method was to heat it as hot and fluid as possible without burning it, and churn it into the pulp canals with a hot instrument. I happen to remember one case for which I held a little broken piece of crockery containing the material, with a pair of pliers over the alcohol lamp till it was just ready to burn, and standing beside the chair while he filled the roots of a lower molar. The material in that state is very plastic and very sticky. I have no knowledge of how long he had been doing that or of whom he learned the method. I have reason to suppose that his operations were very successful. I believe it was this use of a hot instrument by my preceptor that saved me from ever

making the cold operations that became so common soon after, filling a canal with chloro-percha and thrusting into it a cone of hard gutta-percha. It is my belief that this method has been responsible for the large number of abscesses following root-canal operations and the bad name the profession got for this part of our work. A great number of such operations have been successful, but most of you have taken enough of these hard points out of stinking canals to justify my opinion.

I used chloro-percha myself for a time but always followed it by additional gutta-percha made plastic with heat and worked in with a hot instrument. It was not very long before the "Pure volatile eucalypti extract" of Sander and Son, Australia, was substituted for the chloroform, and with that I used, and have ever since, the "Hill's Stopping" preparation of gutta-percha. For a good while I have used Dr. Buckley's eucalyptol compound. This method was not original with me and I do not know who first advised it. Dr. A. E. Matteson was one of the early users of it. Perhaps it was from him I learned it. This method has served me so well that I have continued it to the present time and all of the root fillings the history of which I will presently give you were made in this way. I will not advise it in competition with the method described and skillfully used by Dr. Gethro, Dr. Coolidge, and others, or the Callahan method of infiltrating the dentin with a solution of rosin, or, perhaps, the precipitation of silver, if the formalin used can surely be kept away from the apical space.

Many different materials have been proposed, and to some extent used for filling pulp canals. In the old days some men very successfully used tin foil instead of gold foil. Gold, silver, copper and lead wires have been used by some operators. Dr. J. Foster Flagg used and persistently advocated cotton and creosote and affirmed that he smelled the creosote on removing some of his fillings years afterward. Other dentists removed a good many of them for the relief of trouble and smelled something quite different. Dr. J. N. Crouse filled pulp canals successfully with oxychloride of zinc and he believed that material would be effectively antiseptic for a long time. Some have tried to use the ordinary oxyphosphate cement, with how much success or satisfaction I do not know.

About fifty years ago Dr. Kennicott and some others advised what they called "knocking out" the living pulps of upper front teeth with a tapering hickory stick, struck a pretty sharp blow with a mallet. The pulp was expected to come away with the stick, and the same stick, or a similar one fitted more carefully, was sometimes used to fill the canal. It was claimed that this procedure was not very painful, but it is my belief that a large proportion of the men who tried it once did not do it any more.

No. 1. Mrs. A—: Three root fillings. Lower right first bicuspid root filled January, 1889, shows very slight shadow at apex. No history of trouble; filling to end. Lower right first molar, root filled in February, 1896. X-ray shows nothing wrong; have refilled crown very recently without disturbing root fillings, which are scarcely visible in X-ray and canals not at all. Right upper first bicuspid, September, 1899. X-ray shows nothing wrong, filling shows two-thirds length of root, no canal visible beyond. Patient has had some arthritis in finger joints. Son is a physician.

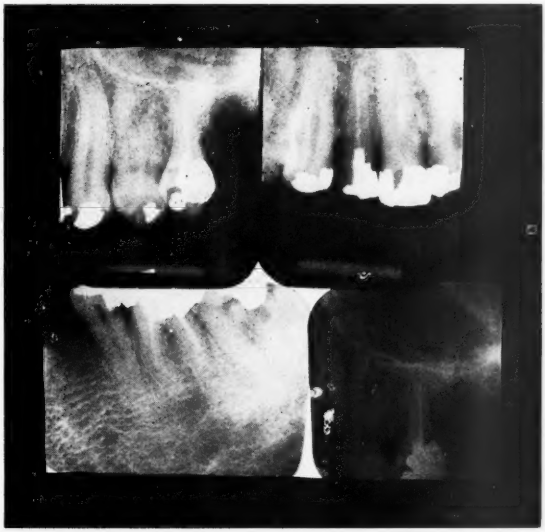
No. 2. Mr. B—: Record of fourteen root fillings. Upper right, second molar January 1891—July, 1905, first molar February, 1884. Bicuspids 1891, X-rays show nothing wrong. Upper, left, first molar October, 1882, shows slightly thickened membrane all over roots. Second bicuspid January, 1899, first bicuspid March, 1912, apparently all right.

Lower right, first molar June, 1887, abscess treated, looks all right; second molar March, 1915, out; third molar February, 1902, out. Lower left, second bicuspid and second molar, carrying bridge to replace first molar. Third molar March, 1908, roots of all three look well. No history of illness of any kind.

No. 3. Mr. B—: Five root fillings. Right upper, third molar July, 1915; second molar July, 1917; second bicuspid March, 1893. Left upper, second bicuspid February, 1900; first molar January, 1894. Roots of all look healthy, but X-rays show neither root fillings nor pulp canals plainly. No history of ill health.

No. 4. Miss C—: Two root fillings. Right upper cuspid, January, 1913. Nothing looks wrong about it, neither filling nor canal shows to end of root. Left lower first molar, March, 1913, developed abscess and after persistent treatment was extracted.

No. 5. Mr. C—: Five root fillings. Right upper lateral, March, 1917, all right; left upper second bicuspid, August, 1905, all right; first molar, May, 1891, out. Lower left first molar, December, 1897, slightly suspicious at mesial root; right third molar, all right but X-ray indistinct, showing neither filling nor canals much beyond pulp chamber.



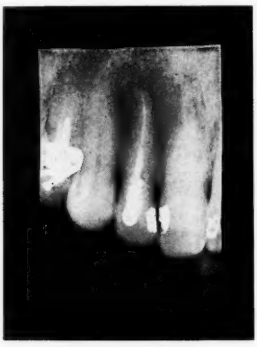
No. 5.

No. 6. Miss D—: Six root fillings. Right upper second bicuspid, December, 1891, all right, neither filling nor canal visible in upper half of root. Left upper cuspid, carries bridge, root membrane shows slight line of thickening; first bicuspid 1891, out; second bicuspid carries bridge, membrane same as cuspid. Lower right lateral and cuspid, abscesses treated, all right at apices.

No. 7. Miss D—: Six root fillings. Upper left, second bicuspid July, 1906, out; second molar February, 1884, out. Lower left, second molar July, 1883, out; first bicuspid March, 1902, good, no

canal visible in lower part; lower right second bicuspid and second molar, carrying bridge, canals invisible toward ends of roots.

No. 8. Mr. D—: Fourteen root fillings. Upper right, first molar December, 1908, out; second bicuspid, good; first bicuspid, March, 1911, slight shadow at apex; cuspid, November, 1908, good; lateral February, 1915, and central January 1917; incisors slight shadows; fillings show to near ends and no canals show beyond. Upper left: first bicuspid



No. 13.

June, 1915, all right; first molar April, 1890, out. Lower left: third molar March, 1903, out; second bicuspid, September, 1919, no canal visible beyond crown pin. Lower right: first bicuspid Feburary, 1917, good, filling two-thirds of root, no canal visible beyond; second bicuspid, November, 1875, out; cuspid, first molar March, 1911; second molar January, 1900, both good. History of continuously excellent health for twenty or thirty years past.

No. 9. Mr. F—: Two root fillings. Right upper lateral October, 1915, bone at apex perfect, filling shows to end of canal; left lower second molar December, 1908, out.

No. 10. Mr. F—: Thirteen root fillings. Upper right, second molar November, 1903, lingual root extracted, out; First molar February, 1887, out; first bicuspid, November, 1875, out; cuspid, good; lateral August, 1906, out; both centrals, good. Left upper lateral, September, 1902, good (pocket); cuspid, September, 1906, good. Lower left, second molar, March, 1895, out; right, first molar March, 1905, out; second, November, 1889, out; third, November, 1899, out.

No. 12. Mr. G—: Six root fillings. Upper, right, first molar October, 1909, out; first bicuspid, April, 1896, good, cuspid September, 1917, good, filling not quite to end of canal. Left: first molar March, 1911, good, neither canals or root fillings visible. Lower, left, first molar November, 1891, out; second bicuspid February, 1892, refilled Jul. 1905, good, no canal visible beyond filling.

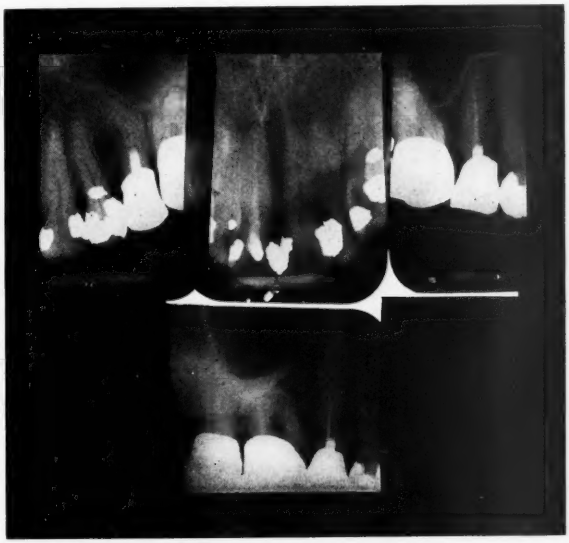
No. 13. Miss G—: Two root-fillings. Right, upper lateral, December, 1877, good, filling shows to end of canal. Right, lower second bicuspid, November, 1891, out.

No. 14. Mr. J—: Two root fillings. Upper, left, first molar, March, 1891, out; second molar, April, 1881, doubtful, may be shadow of antrum, filling shows to end. No history of ill health.

No. 15. Mrs. L—: Nine root fillings. Right, upper, second bicuspid and second molar carrying bridge Dec. 1905, good; central, October, 1872, abscess, treated again May, 1899, crown February, 1904, now out. Left upper, central November, 1895, good; second bicuspid February, 1905, good, neither filling nor canal show in upper half of root; first molar April, 1912, good. Lower, right, first bicuspid, good, neither filling nor canal show quite to apex; second bicuspid, August, 1878, good,

same as first bicuspid; second molar December, 1905, good.

first molar, February, 1901, good; second molar January, 1916, good. Lower, left,



No. 16.

No. 16. Mrs. McD—: Nine root fillings. Upper, right, first molar, October, 1920, good; second bicuspid, May, 1914, good; left, central, July, 1915,

second molar March, 1914, good, fillings show very little, canals invisible; right, first molar, January, 1892, crown October, 1907, shadow at apex of mesial root,

No. 16.

good, fillings show to extreme ends of roots; second bicuspid, June, 1902, good; in small part of root no canal visible;

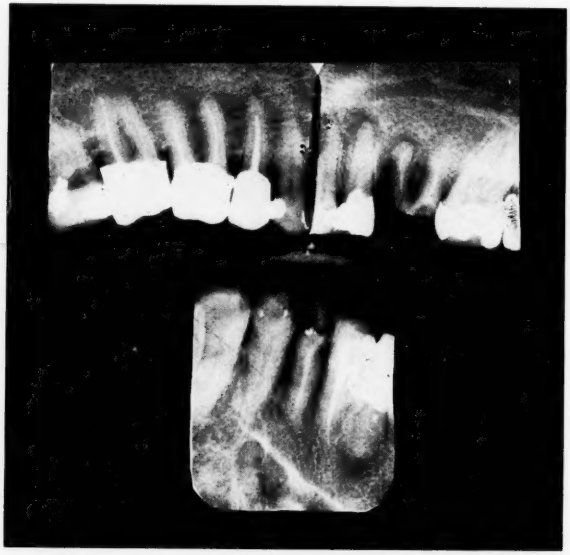
tenderness of gum over it, gave directions for extraction. Second molar, January, 1901, good, neither fillings nor canals

visible in lower half of roots. No history of ill health of any kind.

No. 17. Miss M—: Three root fillings. Upper, right lateral, February, 1888, good, filling to end of canal. Lower, left first molar, May, 1883, good, fillings show to end of roots. Right first molar, July, 1888, broken or decayed to gum, slight shadow at mesial root, fillings to end of roots.

No. 20. Mrs. M—: Two root fillings. Upper, left second molar, July, 1892, out. Lower, right central June, 1886, good, no filling or canal visible in lower portion.

No. 21. Mrs. M—: Seven root fillings. Upper, right, second molar, December, 1898, good; first molar, August, 1917, good, root fillings show but little in these X-rays; left, lateral, July, 1894,



No. 17.

No. 18. Miss M—: Three root fillings. Upper, right, second bicuspid, July, 1889, no X-ray; left, second bicuspid, August, 1883, good, root filling shows in both canals; first molar August, 1883, out.

No. 19. Mr. M—: Four root fillings. Upper, right, first bicuspid, October, 1894, out; cuspid, November, 1913, good, filling to end. Left, central, August, 1895, good; lateral September, 1913, good. There appears to be a supernumerary above these two; cuspid, October, 1895, out.

filling to end of root, shadow at apex; no history of trouble or sickness. Lower, left, second molar, December, 1917, good, no canals visible beyond fillings in either root; right, first bicuspid, date unknown, good filling to end of canal; second bicuspid, November, 1902, good, no canal visible in lower third of root; third molar, March, 1912, slight shadow at mesial root, no canals or fillings visible in lower part of roots.

No. 22. Miss M—: One root filling. Lower right, first molar, August, 1920. X-ray of September, 1918, showed im-

perfect root filling and slight shadow at mesial root. Canals were treated and refilled and X-ray December, 1921, shows some improvement in appearance but still a slight shadow. There are several other root fillings and history of some arthritis. Extraction of some of them now under consideration.

No. 23. Mr. R—: One root filling. Lower left, second molar, March, 1898, no canals or root fillings. Lower left, second molar, April, 1910, canals and fillings scarcely discernible. Second bicuspid November, 1919, good, filling near or quite to end of canal. Right second molar, July, 1888, good, fillings or canals scarcely perceptible.

No. 27. Mr. S—: One root filling. Lower left, first molar, January, 1900, good, shows filling in two canals in mesial root but shows no fillings or canals in lower half of either root.

No. 19.

No. 20.

no canals or fillings visible in lower half of roots, *very slight* shadow at apices.

No. 24. Mr. R—: One root filling. Lower left, second molar, March, 1901, good, fillings to end of canals.

No. 25. Mr. R—: One root filling. April, 1895, distal root canal not found, in good condition.

No. 26. Mrs. S—: Seven root fillings. Upper left, first bicuspid, May, 1899; second bicuspid, October, 1888; first molar June, 1903, root split and crowned; second molar March, 1895. All these appear to be good but X-rays show

No. 28. Miss S—: Five root fillings. Upper, right, first molar, July, 1919, good; first bicuspid August, 1919, good; left lateral July, 1919, good, filling to end of root; cuspid August, 1919, good, filling to end of root; first bicuspid, September, 1919, good, filling to end of root.

No. 29. Mrs. S—: One root filling. Upper, left, second bicuspid, March, 1914, good, no canal or filling visible in upper half.

No. 30. Miss T—: One root filling.

Lower right, second bicuspid, April, 1917, good, filling to end.

No. 31. Mr. T—: Twelve root fillings. Upper right, third molar, March, 1916, good, neither canal nor filling clearly shown; first molar, October, 1901, X-ray does not show canals or fillings, good. Left, lateral, September, 1911, good, filling to end of canal; cuspid, March, 1916, good, filling to end of canal; First molar, October, 1912, abscess treated, good, fillings show but little, canals not at all; second molar, good; third molar, August, 1915, good. Lower left, second molar, April, 1904, good, fillings to end of canals; first molar, July, 1904, good, fillings to end of canals; second bicuspid, February, 1917, good, no filling or canal shows in lower fourth. Right, second bicuspid, August, 1913, good, filling to end of canal; first molar, good.

No. 32. Mr. W—: Five root fillings. Upper left, first bicuspid, date uncertain, good, no filling or canal showing in upper half of root. Lower, left first molar, July, 1890, slight shadows at ends of both roots, fillings half way down, no canals visible. Right, second bicuspid, August, 1897, good, filling half way down, no canal showing beyond; first molar December, 1915, periodontal membrane slightly thickened, fillings show but little, canals not at all; second molar, good, fillings two-thirds of root, canals invisible beyond.

No. 33. Mrs. W—: One root filling. Lower right second bicuspid, date uncertain, good, filling to the end.

No. 34. Rev. W—: Three root fillings. Upper left, first and second bicuspids, April, 1918, X-rays not clear, show neither canals nor fillings, no evidence of infection. Lower, left second molar, January, 1916, lost by pyorrhea.

No. 35. Mr. W—: Two root fillings. Upper, right cuspid, March, 1919, good, filling to end. Left third molar, February, 1909, good.

No. 36. Mr. Y—: Six root fillings. Upper right, first molar, May, 1887, abscess treated, out; second bicuspid, July, 1909, good, neither canal nor filling shows above crown pin; left, first bicuspid, good, filling to end; second bicuspid, good, shows no filling nor canal in upper third. Second molar, November, 1908, out. Lower, left second molar, October, 1910, good, fillings show in both roots, but not to ends, no canals beyond visible.

No. 37. Miss P—: One root filling. Upper left second bicuspid, March, 1920. Abscess treated, filling to end of roots. No evidence of disease.

No. 38. Mr. A—: One root filling. Upper left cuspid, May, 1907, good, filling to end of canal.

No. 39. Mrs. N—: Three root fillings. Lower left first molar, October, 1900, good, neither canals nor fillings visible in lower half of roots. Lower right second bicuspid, good, filling to end of canal. Second molar, good, fillings and canals invisible in lower half of roots.

No. 40. Miss J—: Three root fillings. Left upper second bicuspid June, 1910. Good, filling to end of canal. Lower left second molar, June, 1910, looks healthy but fillings do not reach ends of canals in either root. Lower right second molar, June, 1910, good, filling to end of canal in distal root, canal in mesial root invisible.

No. 41. Mr. M—: Two root fillings. Upper right first molar, March, 1920, good, fillings to end in lingual and one buccal root, canal in other root not shown. Lower right first molar, May, 1914, good, fillings to end in both roots.

X-rays of upper molars are less satisfactory than others because the antrum or the malar bone interfere to make the definition less clear than is desirable.

Summary

Number of root fillings listed, 170.

Of course 119 appear to have healthy roots at the present time. Thirteen show

shadows at apices with no history or indications of trouble; one shows shadow and tenderness of gum and some soreness under percussion, and was ordered out, four show thickened periodontal membrane with no trouble. Five of those appearing healthy had abscesses treated previous to filling. There may have been others. My record of abscess cases is incomplete. Thirty-one have been extracted. I have no means of knowing how many of these extractions were made necessary by apical trouble and how many by pyorrhea, decay of the crowns or other causes.

If my experience, which I am sure corresponds to that of hundreds of others, shall help a little to support the confidence of the men who are filling the roots of teeth, the purpose in preparing this paper will be accomplished. Perhaps it would be a fine thing if there were some easy and infallible way to make a diagnosis and to carry out the indicated treatment. The fact is that no man living is wise enough or experienced enough to avoid keeping some teeth he ought to extract and extracting some he ought to save. Neither is there any physician wise and experienced enough to avoid sometimes making a mistake of diagnosis and treatment. However, I believe the cases are few that will remain doubtful after all available means have been employed for finding the truth.

Discussion

M. L. Hanaford, Rockford, Illinois: We who have known Dr. Noyes for thirty or forty years, know him to be a careful, considerate, honest man, a man given neither to boasting of his own successes nor intolerant of the boasting of others. So when he sweepingly states at the beginning of his paper that there is in some quarters a craze for the extracting of all pulpless teeth, we cannot minimize it or go around it. It would seem incredible that the learned professions of medicine and dentistry could be swept off their feet by any idea or theory, be it good or bad. But who that has practiced dentistry during the major part of the fifty years reviewed by the essayist, has forgotten the so-called amalgam war, the Arthur theory of the operative separation of teeth for preventing of decay, the new departure of Flagg with its doctrine, "in proportion as teeth need saving, gold is the worst material to use," cataphoresis and others of lesser note? Perhaps out of each of these has come some good, and it is only reasoning from experience to assume that out of this latest craze or fad there will be found and preserved some well needed lessons. Undoubtedly in the past dentists have been too prone to retain teeth in the mouths of patients that for their best good should have been removed.

So we go along like the frog in the well, going up three feet and falling back two feet, still gaining one foot. It seems from the consensus of opinion of the best minds, that there is still hope for the pulpless tooth, the facts being that many filled roots remain uninfected and not only harmless but useful. Dr. Noyes's records show facts and any theory to the contrary must account for those facts. In line with his showing of numerous cases in which root fillings do not reach the apical foramen and yet give rise to no trouble of any kind, in two recent articles in the *Items of Interest,* one by Dr. Carl Grove and the other by Dr. Clyde Davis, they affirm the undesirability of too radical instrumentation in root canals in injury to the living tissue (be it reflected periodontal membrane or fragmentary pulp tissue). This should, in their view, be strictly guarded against. Obviously, they would say, no devitalizing agent like arsenic or other strong chemical should be placed in the canal.

I wonder if these cases of Dr. Noyes's and numerous ones which we have all seen offer any corroborative evidence to such a theory. Methods and materials for filling roots will perhaps never be standardized in the strict sense of the word, but principles will become well established some day, so that dentists will not be quarreling over the question of saving pulpless teeth any more than a quarrel could be started today to determine whether amalgam is a good material for filling cavities of decay in teeth.

Harry F. Lotz, Joliet, Illinois: In reference to the allusion to Dr. J. Foster Flagg in Dr. Noyes's paper, I would like to say that Dr. Flagg left a record of something like 7000 cases. I have carried a central incisor with a cotton filling in it for over fifteen years, and with the X-ray we could find nothing wrong with it. This is a little bit of history of early work in the profession as carried on by the teaching of one school. Possibly there are

other schools in the south, east and west that have achieved tolerably good results by similar treatment.

Fred W. Gethro, Chicago, Illinois: It is not so much the question of the method used as it is of the man. Dr. Noyes with his thorough technic and conscientious way of operating would get results by different methods of operating.

Dr. Noyes's operations not only as to root and gold fillings, but other operations, I suppose, have been the equal of those of any man who has ever practiced dentistry. Throughout his entire professional career, from the day he started out until the present day, his efforts have always been the best and that accounts for his great success.

Dr. Noyes (closing): I do not want to say very much, but I am going to take off my hat to the skill of Dr. Gethro and Dr. Coolidge in the particular technic which they have described. I cannot match that technic.

There is one thing I want to say in regard to these fillings that do not reach the ends of the canals. It is my belief that we should in every case, wherever we can possibly do so, get our filling to the end of the pulp canal. In every one of those cases in which I did not get there, you may depend I spent an hour or more, maybe two or three, in trying to get there. But the point I want to make particularly is that we may ignore absolutely the foramen through the cementum if we can fill the pulp canal to the end of the dentin. While you cannot fill a minute foramen, which is as fine as a hair in some cases, in my judgment a tooth is three or four or ten times as safe if you fill the root to the end of the pulp canal, leaving the fine foramen through the cementum of the root without meddling with it, as it would be if you drilled through the foramen and carried the filling to the end of the root and put a cap over the end of it, as Dr. Rhein advocates.

In regard to partially filled canals, Dr. Hatton said that he had found a small amount of living tissue in a few roots that had carried root fillings part way down and fillings in the crowns for a long time. Until he actually found this, none of us believed it would ever happen. I do not think it happens very often, but it may account for the success of a few of these cases in which we cannot deny the impossibility of getting our fillings to the end, provided we have not poisoned the tissue with arsenic beforehand.

We honor Dr. Flagg for his sincerity, his earnestness and great work in the profession, although some of us think his work was injurious. I have no doubt that a great many cotton fillings he made were successful, but I have seen a considerable number of other men who have taken out some of Dr. Flagg's cotton fillings and did not smell creosote. They were taken out for the relief of trouble in the teeth. I have done the same with a lot of teeth filled with thin chloropercha and a round cone of hard gutta-percha thrust into it. I do not think a great many of them were as good as the solidly packed cotton fillings. I have had a good many cases come to me that were giving trouble and have taken out the fillings and found the roots very foul indeed.

ANNUAL REPORT OF THE SECRETARY OF THE AMERICAN DENTAL ASSOCIATION*

By OTTO U. KING, D.D.S., F.A.C.D., Chicago, Illinois

(Presented to the House of Delegates at the Los Angeles Meeting, July 17-21, 1922)

To the House of Delegates and the Board of Trustees of the National Dental Association.

The following report is submitted covering a period of eleven months—July 25, 1921, to June 17, 1922.

Financial Report by States

The accompanying tables give a comprehensive report of the number of members and the financial showing made by State Societies. These tables have been compiled by a certified public accountant, Harry Thom, who audited the books on June 17, 1922.

Schedule "K" gives a statement of the receipts from State Societies for eleven months, ending June 17, 1922. (See Schedule K in accountant's report to Board of Trustees).

Schedule "L" gives a statement of Relief Fund contributions for eleven months, ending June 17, 1922. (See Schedule L in accountant's report to Board of Trustees).

Schedule "M" gives a report of the remittances to the Research Commission by State Societies.

Schedule "N" gives a comparative statement of paid membership for the years 1917, 1918, 1919, 1920, 1921 and 1922.

Exhibit 2 gives a complete report of the income and expense from July 15, 1921, to June 17, 1922.

Exhibit 1 is the balance sheet of June 17, 1922.

Net Increase in Funds

Relief Fund	$13,618.80
Journal Fund	15,211.61
Research Commission	9,977.92
Total	$38,808.33

Report of Audit, by Harry Thom, Certified Public Accountant is submitted as a part of this report.

Chicago, Ill., June 28, 1922.

Board of Trustees,
National Dental Association,
5 North Wabash Avenue,
Chicago, Illinois.

GENTLEMEN:

As requested we have audited the accounts of National Dental Association for the period July 15, 1921, to June 17, 1922, and submit herewith our report and the following exhibits:

Exhibit I—Balance Sheet at June 17, 1922.
Exhibit II—Statement of Income and Expense for period July 15, 1921, to June 17, 1922.
Exhibit III—Statement of Secretary's Receipts and Remittances.
Exhibit IV—Summary of Expenditure Orders.
Schedule A—Journal Expense.
Schedule B—Secretary-Editor's Department Expense.
Schedule C—Annual Session Expense.
Schedule D—President's Expense.
Schedule E—Treasurer's Expense.
Schedule F—Mouth Hygiene and Public Instruction Committee Expense.
Schedule G—Other Committees' Expense.
Schedule H—Board of Trustees' Expense.

*Transactions of the Los Angeles meeting will be published in book form. These may be ordered from the general secretary's office, $1.00 per copy.

Schedule J—Schedule of Fund Securities.
Schedule K—Statement of Receipts from State Societies.
Schedule L—Statement of Relief Fund Contributions.
Schedule M—Remittances to Research Commission by State Societies.
Schedule N—Comparative Statement of Paid Memberships.

BALANCE SHEET

Assets

Cash on Hand in Bank—$23,099.71.

The following amounts comprise the above total:

Cash in banks and in transit	$21,074.71
Petty Cash Fund	25.00
Working Fund	2,000.00

We reconciled the cash balance per books with certificates received from the Citizens State Bank, Huntington, Indiana, and Holston National Bank, Knoxville, Tennessee.

Accounts Receivable—$6,939.02.

The above amount includes the following items:

Advertising Accounts Receivable	$ 6,354.22
Subscription Accounts Receivable	440.80
Other Accounts Receivable	144.00

We believe that the reserve set up to cover doubtful accounts is sufficient.

Inventories—$6,870.68.

Inventory figures are those submitted to us, and were checked as to footings and extensions.

Fund Assets—$167,509.52.

The changes in the funds making up this total may be summarized as follows:

Relief Fund

Balance—Total Fund at July 15, 1921		**$64,975.74**
Add—Interest Received (net)	**$ 3,149.06**	
Contributions Received	**13,244.90**	
	$16,393.96	
Less—Expenses	**$1,575.16**	
1921 appropriation to General Fund Reserve	**1,200.00**	
	$ 2,775.16	
Net Increase in Fund		**$13,618.80**
Balance June 17, 1922		**$78,594.54**

It is estimated that $850.00 should be appropriated from the above fund and transferred to General Fund for expenses of collecting and handling the receipts.

Journal Fund

Balance—Total Fund at July 15, 1921 as adjusted		**$39,685.85**
Add—Received from Local Committee Annual Session 1921	**$13,045.96**	
Interest on Investments (net)	**2,165.65**	
Net Increase in Fund		**$15,211.61**
Balance—Total Fund at June 17, 1922		**$54,897.46**

Research Commission Fund

Balance—Total Fund at July 15, 1921		**$24,039.60**
Add—Dues, interest received and contributions	**$24,339.10**	
Less—Expenses and grants	**$11,051.18**	
Paid to Trustees of Building Fund	**3,310.00**	
	$14,361.18	
Net Increase in Fund		**$ 9,977.92**
Balance—Total Fund at June 17, 1922		**$34,017.52**

It is estimated that $750.00 should be appropriated from the above fund and transferred to General Fund for expenses of collecting and handling the receipts.

With the exception of Morris Plan Bank certificates amounting to $3,000.00 and the certificates of deposit all of which, we are informed, are in the custody of the Treasurer, all fund securities were counted and examined by us at the depository Union Trust Company, Chicago, and were found correct. See Schedule J.

Furniture and Equipment—$4,351.74.

This account comprises office furniture and fixtures. An appraisal made by Globe Wernicke Company as of January 1, 1922, was incorporated upon the books of account. All subsequent charges are proper additions to this account.

Depreciation for six months at 10 per cent per annum was written off on the appraisal figure.

Journal Equipment—$3,805.35.

This amount is made up of miscellaneous equipment at Huntington, Indiana, used in the publication of the Journal. Inventory was taken as of July 15, 1921, and set up on the books.

Depreciation at 10 per cent was charged off on the inventory figure.

Lantern Slides and Equipment—$448.96.

This amount represents an appraisal made on January 1, 1922. There were no additions subsequent to this date.

Depreciation for six months, at 20 per cent, was charged off on this item.

Library Books—$4,863.86.

This item represents the appraised value of the books and the cost of initial indexing and cataloging.

Liabilities

Accounts Payable—$415.27.

Of the above amount $413.00 represents credit balances in advertisers' accounts, and $2.27 interest received for the Relief Fund and not yet remitted to the Treasurer.

Salaries Accrued—$250.00.

This item, representing one-half year's salary due the Treasurer, has now been paid.

Deferred Income from Subscription—$14,724.55

This amount represents an estimated portion

of dues and subscriptions which have been paid, but are unearned.

Net Worth—$201,856.12.

Of the total Net Worth of $201,856.12, $167,509.52 is appropriated in designated fund reserves as follows:

Relief Fund Reserve	$78,594.54
Journal Fund Reserve	54,897.46
Research Fund Reserve	34,017.52

These amounts are reflected in the Assets either in investments or in cash or in both, leaving the General Fund of $34,346.60 applicable to general needs or for specific appropriations.

The following is a summary of the changes in the General Fund Reserve:

Balance—July 15, 1922, as adjusted		$15,545.87
Add—Net Income (Exhibit II)	$21,637.73	
Appropriation from Relief Fund	1,200.00	
	$22,837.73	
Less—Bad Checks Received	$ 12.00	
Dental Ed. Coun. App.	3,000.00	
Dental Index App.	850.00	
Halsted Medal App.	175.00	
	$ 4,037.00	
Net Increase in Reserve		$18,800.73
Balance at June 17, 1922		$34,346.60

Unexpended appropriations $1,000.00 include $500.00 for Mouth Hygiene and Public Instruction Committee and $500.00 to bring Dr. Boedecker of London to Milwaukee in August, 1922. These amounts have already been appropriated and are therefore noted here.

Income and Expense

All sources of income were tested and found correct. Interest maturities on bonds held were checked and all interest accounted for. All expenditures were checked and were found to have been made on properly approved vouchers.

In Exhibit II we have summarized the operating results for the period. The following shows the same information in a different manner:

Journal—		
Income:		
Advertising	$58,847.06	
Subscriptions (including one-half of membership dues)	27,704.96	
Mailing List Sales	998.00	
Cash Discounts Received	239.48	
Sales of Transcripts of Proceedings	37.10	
Total Journal Income		$87,826.60
Expense:		
Total Expense (Schedule A)	$60,270.59	
70% of Secretary's Department Expense	16,648.05	
Total Journal Expense		$76,918.64
Net Earnings from Journal		$10,907.96
Other Income:		
Membership Dues	$27,309.00	
Cash Discounts Received	181.85	
Miscellaneous Income	4.78	
		$27,495.63
Other Income and Net Journal Earnings		$38,403.59
Other Expense		$16,765.86
Net Income for Period (Exhibit II)		$21,637.73

General

At the time of our audit bonds were in effect on Treasurer, Secretary, and Accountant in the amount of $10,000.00 each.

We are pleased to state that records were found to be adequate and well kept. Your office is now splendidly equipped for efficiency in all departments. Internal checks have been scrutinized and found satisfactory. Your files are adequate and orderly, and the new installation of membership cards will, we are sure, result in a more convenient handling of the members files with resultant economy and satisfaction.

We direct your attention to the cash balance of over $34,000.00 in Research Fund, the greater part of which could no doubt be invested profitably in interest bearing securities. Also in connection with the Research Commission finances we note that the proposed lease of the Institute Building has not yet been consummated. When this matter is definitely settled a record should be made upon the books of National Dental Association covering the entire transaction, and showing the amounts to be received from the trustees of the Institute and the dates on which said amounts shall be paid.

We find that at the date of audit, June 17, 1922, a balance of $4,955.80 remained unexpended in the appropriations made at last annual meeting for the Research Commission.

The appropriations and amounts used together with balance unexpended in each appropriation are detailed as follows:

	Budget Appropriation	Amount Used	Balance Unexpended
Dental Index Bureau	$ 3,000.00	$ 2,577.55	$ 422.45
University of Minnesota	4,000.00	2,831.65	1,168.35
University of California	1,200.00	900.00	300.00
Northwestern University Dental School	1,200.00	1,100.00	100.00
Dr. Percy Howe, Forsyth Institute	2,000.00	1,335.00	665.00
Dr. H. C. Ferris, New York	1,000.00	1,000.00	.....
Chicago College of Dental Surgery	1,200.00	800.00	400.00
Creighton University College of Dentistry	1,000.00	.....	1,000.00
Dr. Wm. Gray, Minneapolis	900.00	.....	900.00
	$15,500.00	$10,544.20	$4,955.80

It is assumed that the unexpended portions of appropriations of last year will be available for expenditures this year, and that additional appropriations for the ensuing year will be voted at the Los Angeles meeting.

In view of the fact that the opening of the annual session is a movable date the present audit and resultant statements cover a period of eleven months only. This affects to quite an extent the value of the comparative statements as all data of 1922 covering eleven months must be adjusted mentally to compare with 1921 data covering twelve months. This is not satisfactory in many respects. Journal expenses this year, for example, cover eleven issues against twelve issues last year, total membership as shown this year must be considered as the number of members who paid during the period of eleven months as against twelve months' collections last year, and so on.

We would respectfully suggest that a fixed date be set for the closing of the books prior to the annual session, this date being placed far enough ahead of any possible opening of the annual session so that time would be given for closing and auditing the books and preparing the statements of the different officers and committees before the annual session opens. We would suggest May 31 with an annual statement of December 31 at which time all subscription and membership accounts are closed.

In conclusion we wish to acknowledge the courtesies rendered to us by the Secretary and his staff during our engagement.

Yours very truly,

HARRY THOM,
Certified Public Accountant.

EXHIBIT I

BALANCE SHEET—JUNE 17, 1922

Assets

Current Assets—			
Cash on Hand and in Bank		$23,099.71	
Accounts Receivable	$ 6,939.02		
Less Reserve for Bad Debts	642.90		
		6,296.12	
Inventories—			
Journal Supplies	$ 5,909.83		
Stationery	535.65		
Office Supplies	425.20		
		6,870.68	
			$36,266.51
Fund Assets—			
Relief Fund Investments	$63,487.60		
Relief Fund Cash	14,927.17		
Interest Due from General Fund Reserve	2.27		
Interest Due from Fiscal Agent	177.50		
		$78,594.54	
Journal Fund Investments	$53,023.70		
Journal Fund Cash	1,338.45		
Accrued Interest on Investments	535.31		
		54,897.46	
Research Fund Cash		34,017.52	
			167,509.52

Fixed Assets—

	Amount	Reserve for Depreciation	Book Value	
Furniture and Equipment	$ 4,492.39	$ 140.65	$ 4,351.74	
Journal Equipment	4,226.75	421.40	3,805.35	
Lantern Slides and Equipment	561.20	112.24	448.96	
Library Books	4,863.86	.....	4,863.86	
				13,469.91
	$14,144.20	$ 674.29		
Total Assets				$217,245.94

Liabilities

Current Liabilities—			
Accounts Payable		$ 415.27	
Salaries Accrued		250.00	
			$ 665.27
Unearned Income from Dues and Subscriptions			14,724.55
Net Worth—			
Designated Fund Reserves:			
Relief Fund Reserve	$78,594.54		
Journal Fund Reserve	54,897.46		
Research Fund Reserve	34,017.52		
		$167,509.52	
General Fund Reserve	$33,346.60		
Unexpended Appropriations	1,000.00		
		$ 34,346.60	
			$201,856.12
Total Liabilities and Net Worth			$217,245.94

EXHIBIT II

STATEMENT OF INCOME AND EXPENSE

Period July 15, 1921, to June 17, 1922

Income—		
Advertising Revenue	$58,847.06	
Subscriptions to Journal (Including ½ of membership dues applicable thereto	27,704.96	
Membership Dues	27,309.00	
Mailing List Sales and Addressing Service	998.00	
Cash Discounts Received	421.33	
Sales of Transcripts of Proceedings	37.10	
Miscellaneous Income	4.78	
Total Income from All Sources		$115,322.23
Expenses—		
Journal Expense (Schedule A)	$60,270.59	
Secretary-Editor's Department (Schedule B)	23,782.93	
Annual Session Expense (Schedule C)	4,940.65	
President's Expense (Schedule D)	1,112.67	
Treasurer's Expense (Schedule E)	647.75	
Mouth Hygiene and Public Instruction Committee Expense (Schedule F)	794.46	
Other Committees' Expense (Schedule G)	1,283.80	
Board of Trustees (Schedule H)	851.65	
Total All Expenses		$ 93,684.50
Excess of Income Over Expenses		$ 21,637.73

EXHIBIT III

STATEMENT OF SECRETARY'S RECEIPTS AND REMITTANCES

Period July 15, 1921, to June 17, 1922

Receipts—			
Current Dues		$ 53,990.00	
Back Dues		314.00	
Subscriptions		1,733.61	
Advertising		58,317.55	
Relief Fund		13,457.99	
Research Commission Dues		21,814.00	
Research Institute Debt		2,400.00	
Social Committee (Milwaukee 1921)		13,045.96	
Mailing List Sales and Addressing Service		857.00	
Miscellaneous		1,894.81	
Total Cash Receipts			$167,824.92
Remittances to Treasurer—			
Remittance Nos. 365 to 384 as follows:			
365 July 30, 1921	$ 2,562.50		
366 Aug. 23, 1921	5,000.00		
367 Aug. 27, 1921	3,000.00		
368 Sept. 27, 1921	5,000.00		
369 Sept. 30, 1921	2,549.16		
370 Oct. 15, 1921	5,000.00		
371 Oct. 31, 1921	4,236.22		
372 Nov. 19, 1921	2,644.30		
373 Dec. 9, 1921	800.00		
374 Dec. 23, 1921	10,402.95		
375 Jan. 6, 1922	10,000.00		
376 Jan. 28, 1922	13,136.96		
377 Jan. 28, 1922	10,000.00		
378 Feb. 13, 1922	17,000.00		
379 March 15, 1922	10,000.00		
380 March 18, 1922	10,000.00		
381 April 7, 1922	10,000.00		
382 April 28, 1922	10,000.00		
383 May 3, 1922	2,000.00		
384 June 7, 1922	10,000.00		
		$143,332.09	
Remittance Nos. 385 to 387 Certificate of Deposit for Relief Fund as follows:			
385 June 13, 1922	$13,112.90		
386 June 16, 1922	217.82		
387 June 17, 1922	125.00		
		13,455.72	
Cash Balance on Hand in Bank (Huntington Bank)		11,037.11	
Total			$167,824.92

SUMMARY OF EXPENDITURE ORDERS 748 TO 985 INC.

Period July 15, 1921, to June 17, 1922

Secretary's Office Expense		$ 24,115.09
Journal Expense		65,116.12
Annual Session Expense		5,290.65
President's Expense:		
Dr. H. E. Friesell	$764.80	
Dr. T. B. Hartzell	347.87	
		1,112.67
Treasurer's Expense		397.75
Dental Educational Council Appropriation		3,000.00
Dental Index Appropriation		850.00
Halsted Medal Appropriation		175.00
Mouth Hygiene and Public Instructions Committee		794.46
Other Committees Expense		1,283.80
Board of Trustees Expense		851.65
Furniture, Fixtures, and Equipment Purchases		1,861.06
Library Books Purchases		907.41
Research Commissions Contributions		21,814.00
Relief Fund—Christmas Seals Expense		1,575.16
Research Institute Building Debt		2,400.00
Miscellaneous Expense		422.92
Chicago Office Working Fund Cash on Hand		2,000.00
Chicago Office Petty Cash on Hand		25.00
Total		$133,992.71

SCHEDULE A
JOURNAL EXPENSE

Period July 15, 1921, to June 17, 1922

Materials Used	$21,282.12
Printing Cost	21,858.86
Salaries	7,473.00
Postage	3,684.76
Electros	1,853.48
Binding Cost	1,288.75
Wrappers and Envelopes	815.91
Bad Debts	698.40
Depreciation on Equipment	421.49
Stationery	284.15
Reporting	184.75
Inserts	114 66
Shipping	102 72
Addressograph Supplies	93.58
Miscellaneous Expense	41.25
Insurance	31 40
Contributions	29.00
Office Supplies	6 35
Traveling Expense	6.05
Total Expense (To Ex. II)	$60,270.59

The above figure does not include Journal expense at the Chicago Office which is included in Schedule B.

SCHEDULE B
SECRETARY-EDITOR'S DEPARTMENT EXPENSE

Period July 15, 1921, to June 17, 1922

Salaries	$13,836.67
Rent and Light	2,923.27
Traveling Expense	2,846.11
Miscellaneous Expense (Moving, Auditing, etc.)	975.47
Postage	967.80
Membership Card Expense	496.16
Telegraph	432.81
Office Supplies	385.88
Depreciation of Furniture and Equipment	252.89
Telephone	181.10
Stationery	124.15
Memberships and Periodicals	107.84
Taxes	77.52
Surety Bond	50.00
Exchange	34.26
Contributions	31.00
Publicity	34.20
Relief Fund Expense	25.80
Total Expense (To Ex. II)	$23,782.93

SCHEDULE C
ANNUAL SESSION EXPENSE

Period July 15, 1921, to June 17, 1922

Transcript of Proceedings and Reporting	$1,470.81
Lecture Fees	950.00
Traveling Expense	914.86
Programs	912.00
Temporary Equipment	437.52
Office Supplies	130.00
Miscellaneous Expense	57.86
Stationery	45.50
Telegraph	18.99
Telephone	2.35
Postage	.76
Total Expense (To Exhibit II)	$4,940.65

SCHEDULE D
PRESIDENT'S EXPENSE

Period July 15, 1921, to June 17, 1922

Traveling Expense	$ 817.96
Stationery	192.78
Telegraph	74.75
Miscellaneous Expense	9.00
Telephone	18.18
Total Expense (To Exhibit II)	$1,112.67

SCHEDULE E
TREASURER'S EXPENSE

Period July 15, 1921, to June 17, 1922

Salary	$ 500.00
Traveling Expense	67.05
Fiscal Agent's Services	10.70
Surety Bond	10.00
Total Expense (To Exhibit II)	$ 647.75

SCHEDULE F
MOUTH HYGIENE AND PUBLIC INSTRUCTION COMMITTEE EXPENSE

Period July 15, 1921, to June 17, 1922

Traveling Expense	$ 324.16
Lantern Slides	217.20
Reprints	177.55
Stationery	68.35
Electros	5.00
Postage	2.20
Total Expense (To Ex. II)	$ 794.46

SCHEDULE G
OTHER COMMITTEES EXPENSE

Period July 15, 1921, to June 17, 1922

Judicial Council—		
Stationery		$ 56.90
Dental Legislation—		
Traveling Expense	$811.00	
Salaries	228.50	
Telegrams	41.45	
Telephone	30.55	
Office Supplies	16.50	
Stationery	5.50	
		1,133.50
Transportation—		
Office Expense	$ 50.00	
Stationery	11.50	
		61.50
Research—		
Traveling Expense		19.20
National Relief Fund—		
Stationery		6.80
Educational Council—		
Reprints		5.90
Total Expense (To Ex. II)		$1,283.80

SCHEDULE H
BOARD OF TRUSTEES EXPENSE

Period July 15, 1921, to June 17, 1922

Traveling Expense	$ 807.08
Miscellaneous Expense	44.57
Total Expense (To Ex. II)	$ 851.65

SCHEDULE J

SCHEDULE OF FUND SECURITIES AT UNION TRUST CO., CHICAGO

As At June 17, 1922

JOURNAL FUND

Bonds

Name	Maturity	Int. Pay	Rate %	Par Value
Cooke County, Tenn. School Bond	9- 1-30	M & S 1	6	$ 4,161.40
Cooke County, Tenn. Highway Bond	9- 1-31	M & S 1	6	2,080.00
Dyersburg, Tenn. School Bond	11- 1-51	M & N 1	6	3,161.10
Govt. of the French Republic	6- 1-41	J & D 1	7½	1,000.00
Kansas City Power & Light Co.	12- 1-40	J & D 1	8	1,000.00
Kingdom of Norway	10- 1-40	A & O 1	8	500.00
Libby McNeil & Libby	5- 1-31	M & N 1	7	1,000.00
Paris, Tenn. Public Improvement	8- 1-51	F & A 1	6	2,145.40
Public Service Co., of No. Ill.	10- 1-56	A & O 1	5	2,000.00
State of Tenn., County of Roane	10- 1-51	A & O 1	6	4,450.80
U. S. of America 1st L.L.	6-15-47	J & D 15	4¼	450.00
U. S. of America 2nd. L.L.	11-15-42	M & N 15	4¼	5,750.00
U. S. of America 3rd L.L.	9-15-28	M & S 15	4¼	2,550.00
U. S. of America 4th L.L.	10-15-38	A & O 15	4¼	16,600.00
U. S. of America 5th L.L.	5-20-23	J & D 15	4¾	100.00
U. S. of America War Savings Stamps	1- 1-23			4,275.00
U. S. of America War Savings Stamps	1- 1-24			800.00
Wisconsin Electric Power Co.	10-15-45	A & O 15	7½	1,000.00
Total				$53,023.70

RELIEF FUND

Bonds

Anaconda Copper Mining Co.	1- 1-29	J & J 1	7	$ 1,000.00
City of Bergen, Norway	11- 1-45	M & N 1	8	1,000.00
E. I. DuPont De Nemours & Co.	5- 1-31	M & N 1	7½	1,000.00
Glidden, State of Iowa, School Bldg.	5- 1-39	M & N 1	5	4,115.60
Haywood County, Tenn., Highway Bond	2- 1-34	F & A 1	5½	2,044.00
Hershey Chocolate Corp.	6- 1-30	J & D 1	7½	1,000.00
Kansas City Power & Light Co.	12- 1-40	J & D 1	8	1,000.00
Kingdom of Belgium	2- 1-41	F & A 1	8	1,000.00
Northern Pacific Great Northern	7- 1-36	J & J 1	6½	1,000.00
Northern State Power Co.	4- 1-41	A & O 1	6	3,000.00
State of Iowa, County of Sac	12- 1-39	J & D 1	5	4,118.00
State of Tenn., County of Knox	7- 1-24	J & J 1	6	1,000.00
U. S. of America 2nd L.L.	11-15-42	M & N 15	4¼	15,000.00
U. S. of America 4th L.L.	10-15-38	A & O 15	4¼	23,350.00
U. S. of America War Savings Stamps	1- 1-23			360.00
				$59,987.60

Stock

U. S. Steel Corporation pref.—5 shares	500.00
Total	$60,487.60

In the above schedule bonds purchased during past eleven months are shown at cost, all others at par.

SCHEDULE K

STATEMENT OF RECEIPTS FROM STATE SOCIETIES

For Eleven Months Ending June 17, 1922

State	Number Members	Current Dues	Back Dues	Research Commission	Relief Fund
Alabama	293	$ 406.00	.....	.....	$ 63.00
Alaska	.....	.....	.....	.....	.....
Arizona	12	84.00	.....	.....	24.00
Arkansas	135	268.00	$ 2.00	.....	38.00
Army Dental Corps	74	146.00	2.00	8.00	9.00
California State	873	1,744.00	.....	1,663.00	785.00
Colorado	361	720.00	2.00	361.00	165.00
Connecticut	441	882.00	.....	441.00	282.00
Cuba	1	3.00	.....	.....	.....
Delaware	40	80.00	.....	.....	24.00
District of Columbia	215	430.00	.....	.....	140.00
Florida	117	234.00	.....	117.00	46.00
Foreign	5	25.00	.....	.....	96.00
Georgia	365	730.00	.....	.....	104.00
Hawaiian Islands	20	40.00	.....	.....	.....
Idaho	56	112.00	.....	.....	67.00
Illinois	2795	5,584.00	6.00	2,861.00	1,242.15
Indiana	858	1,662.00	54.00	858.00	370.00
Iowa	985	1,970.00	.....	976.00	330.18
Kansas	581	1,161.00	2.00	504.00	170.70
Kentucky	349	690.00	18.00	354.00	107.00
Louisiana	244	488.00	.....	48.00	78.20

State	Number Members	Current Dues	Back Dues	Research Commission	Relief Fund
Maine	81	162.00	.....	.....	69.00
Maryland	268	536.00	.....	.....	111.00
Massachusetts	1275	2,550.00	.....	.....	460.12
Michigan	1117	2,210.00	24.00	.....	374.10
Minnesota	1166	2,318.00	14.00	1,166.00	383.50
Mississippi	195	390.00	.....	.....	61.00
Missouri	1062	2,044.00	80.00	1,062.00	555.95
Montana	80	160.00	.....	79.00	55.00
National Capitol	16	32.00	.....	.....	.....
Navy Dental Corps	32	67.00	.....	2.00	8.00
Nebraska	410	820.00	.....	887.00	154.00
Nevada	44	88.00	.....	37.00	.....
New Hampshire	46	92.00	.....	.....	39.00
New Jersey	881	1,762.00	.....	881.00	394.50
New Mexico	59	118.00	.....	.....	22.00
New York	2463	4,926.00	.....	2,438.00	2,020.10
North Carolina	295	590.00	.....	295.00	67.00
North Dakota	197	394.00	.....	.....	92.50
Ohio	1635	3,270.00	.....	1,635.00	718.50
Oklahoma	314	628.00	.....	.....	92.00
Oregon	240	480.00	.....	.....	96.10
Pennsylvania	1985	3,896.00	74.00	1,780.00	1,134.50
Philippine Islands	23	46.00	.....	.....	.....
Porto Rico	47	94.00	.....	.....	.....
U. S. Pub. Health Service	41	82.00	.....	34.00	.....
Rhode Island	141	282.00	.....	.....	66.00
Southern California	742	1,464.00	20.00	.....	.....
South Carolina	100	200.00	.....	.....	62.50
South Dakota	184	368.00	.....	184.00	67.00
Tennessee	272	544.00	.....	272.00	370.00
Texas	592	1,184.00	.....	592.00	200.50
Utah	100	200.00	.....	.....	61.00
Vermont	84	168.00	.....	98.00	37.00
Virginia	329	658.00	.....	329.00	165.00
Washington	500	998.00	2.00	500.00	228.50
West Virginia	262	516.00	8.00	262.00	90.00
Wisconsin	1038	2,070.00	6.00	1,038.00	486.50
Wyoming	48	96.00	.....	48.00	29.00
Various	2	28.00	.....	9.00	332.80
Research Contributions Collected by Treasurer				125.10	
	27126	*$53,990.00	$314.00	$21,944.10	$13,244.00

*Current Dues are divided as follows:

50% to Journal Revenue	$26,995.00
50% to General Revenue	26,995.00
	$53,990.00

SCHEDULE L

STATEMENT OF RELIEF FUND CONTRIBUTIONS

For Eleven Months Ending June 17, 1922

State	Amount Received	Membership	Number of Contributors	Per Cent of Members Contributing
Alabama	$ 63.00	203	61	30.4
Alaska	.....	....	....	....
Arizona	24.00	42	22	52.3
Arkansas	38.00	135	33	24.4
California	785.00	1615	687	42.5
Colorado	165.00	361	152	42.1
Connecticut	282.00	441	248	56.2
Cuba	.....	1	....	....
Delaware	24.00	40	20	50.0
District of Columbia	140.00	215	110	51.1
Florida	46.00	117	41	35.0
Georgia	104.00	365	88	24.1
Hawaiian Islands	.....	20	....	....
Idaho	67.00	56	56	100.0
Illinois	1,242.15	2795	1057	37.8
Indiana	370.00	858	336	39.0
Iowa	330.18	985	315	31.9
Kansas	170.70	581	159	27.3
Kentucky	107.00	349	101	28.9
Louisiana	78.20	244	61	25.0
Maine	69.00	81	63	77.7
Maryland	111.00	268	88	32.8
Massachusetts	460.12	1275	427	33.4
Michigan	374.10	1117	338	30.2
Minnesota	383.50	1166	367	31.4

State	Amount Received	Membership	Number of Contributors	Per Cent of Members Contributing
Mississippi	61.00	195	56	28.7
Missouri	555.95	1062	336	31.6
Montana	55.00	80	49	61.2
Nebraska	154.00	410	136	33.1
Nevada	.....	44	....	....
New Hampshire	39.00	46	35	76.0
New Jersey	394.50	881	326	37.0
New Mexico	22.00	59	20	33.9
New York	2,020.10	2463	1204	48.8
North Carolina	67.00	295	63	21.3
North Dakota	92.50	197	84	42.6
Ohio	718.50	1635	527	32.2
Oklahoma	92.00	314	82	26.1
Oregon	96.10	240	87	36.2
Pennsylvania	1,134.50	1985	733	36.9
Philippine Islands	.....	23	....	....
Porto Rico	.....	47	....	....
Rhode Island	66.00	141	62	43.9
South Carolina	62.50	100	54	54.0
South Dakota	67.00	184	62	33.7
Tennessee	370.00	272	*200	73.5
Texas	200.50	592	177	29.9
Utah	61.00	100	56	56.0
Vermont	37.00	84	34	40.4
Virginia	165.00	329	150	45.6
Washington	228.50	500	210	42.0
West Virginia	90.00	262	89	33.9
Wisconsin	486.50	1038	468	45.0
Wyoming	29.00	48	20	41.6
U. S. Army	9.00	74	8	10.8
U. S. Navy	8.00	32	5	15.6
Foreign	96.00	5	5	100.0
National Capitol	.....	16	....	....
Various	332.80	2	2	100.0
U. S. Public Health Service	.....	41	....	....
	$13,244.90	27126	10171	37.2

*Estimated.

SCHEDULE M

REMITTANCES TO RESEARCH COMMISSION BY STATE SOCIETIES

State	Amount Received 1921	Amount Received 1922	Number Members 1922	Average Amount Per Member 1922
Army Dental Corps	$ 3.00	$ 8.00	74	$0.11
Alabama	.....	.....	203	.....
Alaska	.....	.....	....	.....
Arizona	.....	.....	42	.....
Arkansas	.....	.....	135	.....
California State	.....	*1,663.00	873	.84
California Southern	.....	.....	742	.....
Colorado	362.00	361.00	361	1.00
Connecticut	625.00	441.00	441	1.00
Cuba	.....	.....	1	.....
Delaware	.....	.....	40	.....
District of Columbia	204.00	.....	215	.....
Florida	159.00	117.00	117	1.00
Foreign	.....	.....	5	.....
Georgia	.....	.....	365	.....
Hawaiian Islands	1.00	.....	20	.....
Idaho	.....	.....	56	.....
Illinois	2,892.00	2,861.00	2795	1.02
Indiana	1,153.00	858.00	858	1.00
Iowa	929.00	976.00	985	.99
Kansas	451.00	504.00	581	.86
Kentucky	404.00	354.00	349	1.01
Louisiana	.....	48.00	244	.19
Maine	.....	.....	81	.....
Maryland	.....	.....	268	.....
Massachusetts	.....	.....	1275	.....
Michigan	.....	.....	1117	.....
Minnesota	1,163.00	1,166.00	1166	1.00
Mississippi	207.00	.....	195	.....
Missouri	1,027.00	1,062.00	1062	1.00
Montana	92.00	79.00	80	.99
National Capitol	.....	.....	16	.....
Navy Dental Corps	.....	2.00	32	.06
Nebraska	7.00	†887.00	410	1.00
Nevada	.....	37.00	44	.....
New Hampshire	.....	.....	46	.....

State	Amount Received 1921	Amount Received 1922	Number Members 1922	Average Amount Per Member 1922
New Jersey	864.00	881.00	881	1.00
New Mexico	.....	.....	59	.....
New York	83.00	2,438.00	2463	.99
North Carolina	277.00	295.00	295	1.00
North Dakota	.....	.....	197	.....
Ohio	1,581.00	1,635.00	1635	1.00
Oklahoma	1,024.00	.....	314	.....
Oregon	.....	.....	240	.....
Pennsylvania	1,661.00	1,780.00	1985	.89
Philippine Islands	.....	.....	23	.....
Porto Rico	.....	.....	47	.....
Rhode Island	.....	.....	141	.....
South Carolina	.....	.....	100	.....
South Dakota	208.00	184.00	184	1.00
Tennessee	406.00	272.00	272	1.00
Texas	592.00	592.00	592	1.00
U. S. Public Health Service	.....	34.00	41	.83
Utah	282.00	.....	100	.....
Vermont	.....	98.00	84	1.16
Virginia	259.00	329.00	329	1.00
Washington	475.00	500.00	500	1.00
West Virginia	252.00	262.00	262	1.00
Wisconsin	925.00	1,038.00	1038	1.00
Wyoming	65.00	48.00	48	1.00
	$18,633.00	$21,810.00	27124	.752

*Includes $928.00 applicable to 1921.
†Includes $477.00 applicable to 1921.

SCHEDULE N

COMPARATIVE STATEMENT OF PAID MEMBERSHIPS

For Years 1917, 1918, 1919, 1920, 1921, and 1922

State	Number of Paid Memberships 1917	1918	1919	1920	1921	1922*	Increase 1921-22	Decrease 1921-22	Delegates Allowed
Alabama	198	198	271	246	219	203	....	46	2
Alaska	1	35	....	12	10	....	....	10	1
Arizona	24	18	22	32	42	42	....	....	1
Arkansas	135	104	164	131	96	135	39	....	2
California State	679	504	827	697	953	873	....	80	5
Colorado	295	302	326	370	362	361	....	1	3
Connecticut	396	421	388	434	487	441	....	46	3
Cuba	....	....	....	....	....	1	1	....	1
Delaware	3	4	31	59	38	40	2	....	1
District of Columbia	123	118	122	176	204	215	11	....	2
Florida	148	136	179	143	162	117	....	45	2
Foreign Members	8	1	....	....	5	5	....	....	1
Georgia	212	269	302	356	321	365	44	....	3
Hawaiian Islands	....	15	21	22	34	20	....	14	1
Idaho	....	....	6	117	65	56	....	9	1
Illinois	1844	1979	2348	2542	2830	2795	....	35	15
Indiana	973	837	1106	922	1156	858	....	298	5
Iowa	900	903	900	973	958	985	27	....	6
Kansas	440	428	410	472	508	581	73	....	4
Kentucky	354	308	338	341	404	349	....	55	3
Lousiana	123	141	147	240	208	244	36	....	2
Maine	155	144	113	111	197	81	....	116	1
Maryland	210	186	199	219	241	268	27	....	2
Massachusetts	215	951	1028	1068	1372	1275	....	97	7
Michigan	765	788	926	919	978	1117	139	....	7
Minnesota	745	870	882	1159	1169	1166	....	3	7
Mississippi	125	140	159	216	207	195	....	12	2
Missouri	804	746	1069	1048	1035	1062	27	....	6
Montana	114	59	144	71	118	80	....	38	1
National Capital	35	37	40	46	48	16	....	32	1
Nebraska	411	395	421	426	484	410	....	74	3
Nevada	....	1	....	12	....	44	44	....	1
New Hampshire	24	22	15	58	56	46	....	10	1
New Jersey	569	567	604	715	835	881	46	....	5
New Mexico	49	59	70	59	57	59	2	....	1
New York	1565	1434	1783	1984	2311	2463	152	....	13
North Carolina	291	123	146	269	277	295	18	....	2
North Dakota	141	4	296	192	163	197	34	....	2
Ohio	1327	1258	1312	1459	1581	1635	54	....	9
Oklahoma	297	278	319	356	349	314	....	35	3
Oregon	184	143	277	177	308	240	....	68	2
Pennsylvania	1443	1091	1447	1672	1861	1985	124	....	11
Philippine Islands	2	1	1	1	4	23	19	....	1
Porto Rico	37	....	1	36	1	47	46	....	1
Rhode Island	119	128	122	164	154	141	....	13	2

State	Number of Paid Memberships						Increase	Decrease	Delegates
	1917	1918	1919	1920	1921	1922*	1921-22	1921-22	Allowed
Southern California	440	381	508	473	639	742	103	....	5
South Carolina	177	3	277	155	67	100	33	....	2
South Dakota	175	158	206	214	208	184	....	24	2
Tennessee	265	218	132	369	408	272	....	136	2
Texas	463	468	551	547	592	592	....	....	4
Utah	116	128	136	142	138	100	....	38	2
Vermont	85	75	66	90	105	84	....	21	1
Virginia	193	210	241	268	265	329	64	....	3
Washington	451	503	508	503	475	500	25	....	4
West Virginia	182	168	221	243	252	262	10	....	2
Wisconsin	695	518	773	1034	920	1038	118	....	6
Wyoming	49	21	35	22	65	48	....	17	1
U. S. A. Dental Corps	44	60	351	49	107	74	....	33	1
U. S. N. Dental Corps	13	14	53	27	13	32	19	....	1
U. S. Pub. Health Service	....	....	....	....	....	41	41	....	1
Special	....	....	....	....	....	2	2	....	....
Total	19831	19071	23340	24858	27152	27126	1380	1406	192

*The year 1922 covers a period of eleven months only.

Membership

From January 1, to June 17, 1922, a period of five and a half months, 27,126 have paid their annual dues. We will close our fiscal year on December 31 with the largest membership in the history of the organization.

The Journal

The year 1921 was one of great depression and depreciation in the commercial world. Practically all activities were affected and the printing and publishing field was no exception; the reaction to abnormal prices of the preceding year or two was such that great losses were common. Our Journal, however, was affected but little by the conditions; in fact, the year was a prosperous one from the financial point of view, satisfactory in every respect to all the enterprises connected with the publication and with our business matters generally.

The total Journal income has been $87,826.60; total expenses (Schedule "A") $76,918.64, leaving the net earnings $10,907.96.

Advertising Department

This year the receipts from advertising exceed the receipts from dues and subscriptions. The total advertising earned during the period from July 15, 1921, to June 17, 1922, (eleven months) was $58,847.06 which is an increase of $1,594.73 over the twelve months' period reported July 15, 1921. In order to present a clearer statement of the net increase in income from advertising, we will add to this report the amount we already have for June, 1922. This makes a total increase of $6,394.73 for the twelve months' period compared with the twelve months' period of last year's report.

We have perfected plans to increase the advertising rates in The Journal which will bring us an additional increase in revenue of $8,000 during the next twelve months.

The confidence of the dental profession (in the advertising pages), maintained by the high standard governing acceptance of all advertisements, is no doubt a great factor in the volume of advertising in The Journal and the increased revenues therefrom. The rules governing advertising in The Journal of the National Dental Association are as follows:

1. To follow the principles laid down by the American Medical Association, particularly in regard to accepting only copy that has been approved by

their council on Pharmacy and Chemistry, or the Formulary Committee of the National Dental Association.

2. An advertiser is not permitted to advertise his product as the best in the world, or in any other way make extravagant statements which he could not prove. No advertiser is allowed to reflect on his competitors' products or in any way impugn the motives of our other advertisers.

3. No advertisement will be accepted which would result, either by intent or inference, in deceiving, defrauding or misleading the reader.

4. Extravagantly worded copy is subject either to revision or to rejection.

5. Disparagement of competitors' goods for the purpose of lauding the advertiser's own products is not permissible.

6. All medical and dental preparations must conform to the ruling of the Council on Pharmacy and Chemistry of the American Medical Association or the Formulary Committee of the National Dental Association before they can be advertised in our columns. A copy of the Council's rules will be mailed on application.

7. Editorial quotations from the Association's publications cannot be used in advertisements in The Journal. This rule does not apply to quotations from book review.

8. The Journal of the National Dental Association must not be used by advertisers as a reference, either as to their responsibility or as to their ethical standing.

9. No financial advertisements will be published in which extraordinary returns are promised. Neither must the obviously untrue statement, "absolutely safe" be applied to any proposition advertised.

10. Stocks of recognized standing listed on a reputable exchange may be advertised; as may also bonds when for sale by a bond house of unquestionable responsibility.

11. No advertisements of tobacco will be accepted.

12. The word "free" when used in an advertisement must mean just what it says—unrestrictedly free.

13. Illustrations which contain solid backgrounds or heavy borders are subject to being stippled or otherwise changed at the advertiser's expense.

14. Advertisements running on a "till forbidden" basis do not protect the advertiser against advances in rates.

15. Truth in advertising has been the governing principle in accepting advertising copy. The following clause has always been printed in our contracts: "We accept contract for advertising in The Journal subject to our censorship." It may be of interest to review the fact that the so-called Printers' Ink statute has been one of the greatest helps in bringing real ethics into the advertising field. That publication, with the aid of competent lawyers, framed an act to punish fraudulent advertisers. This act has now been put on the statute books of twenty-eight states. This law has teeth. The Association of Advertising Clubs, an organization with 15,000 members, maintains a fund to enforce it.

The larger point of view, good will, fair play and welfare work are all results of a higher code of business ethics just as surely as they are the source of greater profit. The Journal of the National Dental Association, at the present time, guarantees all the advertising. Readers are assured that the National Dental Association stands behind every offer that appears in the advertising

pages, both morally and financially. From the advertiser's standpoint, this has been one of the strongest factors in the building up of our advertising pages. We have never found it necessary to reimburse anyone.

These rules have been adopted by the Board of Trustees.

Library

In 1919 we laid the foundation for a National Dental Association library. We have at the present time 1658 volumes, valued at $4,863.86. During the last few months, this library has been carefully indexed and catalogued by a librarian.

The dental profession is urged to enthusiastically cooperate in this effort to bring to fruition a real National Dental library under the control of the National Dental Association.

Unfinished Business

At the Milwaukee session last year an Amendment to the Constitution and By-Laws was submitted, the following to lie over for action at the 1923 session of the House of Delegates:

Article 11, Section I—the annual dues of the Association shall be $2.00, payable January first for the ensuing year. The proposed Amendment would change this Section to read: the annual dues of this Association shall be $3.00 payable January first for the ensuing year.

Recommendations

1. That the Transactions of the National Dental Association be published in its Journal so that every member may have this information.

2. That The Journal be published semi-monthly, thus making it possible for the publication of twenty-four numbers instead of twelve.

3. That if The Journal of the National Dental Association is published semi-monthly, the subscription price be increased to $4.00 per year for non-members living in the United States and $5.00 for foreign dentists.

4. That action on the Amendment now lying on the table proposing that the dues be increased to $3.00 be deferred until the next annual session. There is no necessity for passing this Amendment at this time for our present receipts are sufficient to take care of all of our expenses, including the publication of The Journal. This recommendation deferring action on the Amendment is offered so that if the cost of publishing The Journal semi-monthly exceeds our present income, the Amendment may be passed at the 1923 session.

5. As a means of securing more practical and eminent cooperation between the officers of the various State Societies and other constituent organizations and the officers of the National Dental Association, a quarterly bulletin should be published. The purpose would be to devote the bulletin to a full and free interchange of opinions on organization subjects and relative topics including economics, social and ethical questions pertaining to dentistry, legislation and educational propaganda work. Not the least of its functions, however, would be to develop a better and more effective organization. This bulletin should be mailed gratuitously to all the officers and committeemen of the National Dental Association, members of the House of Delegates and public health workers. The total mailing list would be approximately 3500. A sixteen page bulletin 6½ x 10¼, using enamel cover and enamel paper would cost approximately $150 per issue. However, there would be some other expenses incident to securing an addresso-

graph mailing list. If the Board of Trustees of the House of Delegates decide to publish this bulletin, at least $1,000 should be appropriated.

6. During the year the Swanson-Ogilvie Company, Industrial Engineers, have assisted in perfecting a standardized form of bookkeeping record and filing systems for every department of our association work. At the present time they are perfecting a standardized bookkeeping system for the adoption of State Societies. This company should be permitted to continue its work.

7. Lantern Slides and outline lectures free.

The National Dental Association has made marvelous strides and is to be congratulated on its unusual organization work since 1913 as witnessed by the following facts:

From a small membership of less than seven hundred, it has grown to a total membership, including both active and delinquent members, of 33,500 with over 28,000 members paid up during the first five months of the fiscal year.

The assets have grown from practically zero to $78,594.54 in the Relief Fund, and $54,894.46 in the Journal Fund, while the Research Commission has collected $34,017.52 which does not include the assets in the Research Institute. In fact, the total net worth on July 17, 1922, was $217,245.94. This amount does not take into consideration the assets as represented in the good will of The Journal.

Other matters in which the office of the Secretary of the Association has been concerned, namely the report of the Board of Trustees to the House of Delegates, Treasurer's Report, Relief Fund Report, Legislative Committee's Report, Research Commission Report, etc., will be reported to the House of Delegates.

G. A. Crise, Kansas, moved that a vote of thanks be extended to the Secretary for the efficient manner in which he had done his work during the past year.

Seconded and carried.

REPORT OF COMMITTEE ON DENTAL NOMENCLATURE*

By L. PIERCE ANTHONY, D.D.S., Philadelphia, Pennsylvania, Chairman

(Presented to House of Delegates, National Dental Association, Los Angeles, California, July 17-21, 1922)

YOUR committee begs to report as follows: The purpose of the nomenclature of dentistry as of any profession is to provide the means for the intelligible interchange of ideas, to the end that its development and growth may progress and keep pace with that of the other professions.

Through its literature each profession becomes acquainted with the state of development of its sister professions and thereby is judged as to its intellectual statue and the verity of its accomplishments. The scientific status, the exactness of knowledge, the cultural developments and the mental habits of a profession are distinctly reflected in its literature, and the retarding influence of insufficient and defective vehicles of expression must be removed if it is to keep pace with the other learned professions.

We are all conscious of the fact that the development of dentistry for the past two decades has been moving forward with such rapid strides that our present terminology no longer meets the demands of the science and imposes a serious handicap upon our progress that we can ill afford to longer ignore.

The expansion of the field of dental activities resulting from the general recognition of the interrelationships of oral infections and bodily disease has necessitated an equivalent increase in our descriptive nomenclature. In response to this need for a larger terminology we have unfortunately been flooded with a group of terms that are manifestly amateurish in conception and defective in their etymology, hence they fail to correctly function as descriptive designations.

It is quite apparent that the busy practitioner is indifferent to this important phase of our literature, seemingly being content with and almost demanding that the subject be dealt with by those intimately concerned with the historical record of dentistry in the literature—namely, teachers, writers, editors, etc., they being in a better position to undertake the task involved in the harmonizing of our present terminology and enlarging it to meet our requirements.

Since the notable efforts of Black, Guilford, Molyneaux, Wilson and others at the time of the World's Columbian Dental Congress, and later those of the American Institute of Dental Teachers,

*This report will be published in the *Transactions of the American Dental Association,* held in Los Angeles, California, 1922. These may be purchased at $1.00 each through the office of the American Dental Association, 5 N. Wabash Avenue, Chicago, Illinois.

little has been done to increase and enlarge our nomenclature, with the exception of some individual efforts. Individual efforts, while they may be praiseworthy and often productive of much good, inevitably lead to confusion in the use of several words to mean the same thing, and mainly serve to impress more forcibly the necessity for coordination of efforts to the desired end.

Any effort, however, to standardize our nomenclature should be made with a definite purpose of conforming it as closely as possible to the general laws of nomenclature as already accepted by the biological sciences. The desirability of this course needs only to be mentioned here; so also is it only necessary to suggest the resulting enormous saving of duplication of work in the elemental phase of the undertaking that would accrue from this course.

There is a two-fold responsibility involved in the adoption of a scientific dental terminology. Terms must not only express their meaning with precision, but as in medicine many terms are used to express a relation to a pathological or other biological phenomenon. These terms must not only be correct in an etymological sense; they must be so coined as to have a correct scientific meaning, and those who originate them must not only possess the cultural fundamentals necessary to constructive work in the science of nomenclature, but must also have a broad scientific vision, as well as an intimate knowledge of the subject in all its aspects.

Realizing the desirability of coordinating the various efforts being made to bring about uniformity of dental terms and conscious of the necessity for a distinct forward step in the field of dental nomenclature, the Dental Editors' Club, an organization composed of the editors of dental magazines of the United States and Canada, at its meeting in Milwaukee passed the following resolution:

> WHEREAS, The Dental Editors' Club of North America at its meeting in Milwaukee, August 17, 1921, realizes the pressing need for standardization of dental terms, be it
>
> *Resolved*, That the Dental Editors' Club of North America petition the House of Delegates of the National Dental Association to appoint a standing committee on nomenclature, to whom matters relating thereto emanating from various committees on nomenclature of other organizations be referred for consideration, to the end that the standardization and harmonizing of our technical dental terms may be under the direction and control of our National organization.

Pursuant to the intents and purposes of the above resolution, the National Dental Association appointed the following committee on Dental Nomenclature: Drs. C. N. Johnson, Otto U. King, H. E. Friesell, H. L. Wheeler and L. Pierce Anthony, as chairman.

Soon after the adjournment of the Milwaukee meeting, the chairman of the committee took steps to get in close touch with those who have shown interest in this phase of dentistry, with the result that many suggestions from individual members of the profession were offered as to the adoption of new words and many criticisms made upon words now in use. We also have had the cooperation of several subordinate organizations of the National Dental Association who have suggested words relating particularly to the specialties with which they are concerned.

The committee, while feeling the necessity of prompt action in regard to some of the words and suggestions offered, does not feel that it can present a final and definite report on all the terms that have been considered at this time.

It is not an easy task to decide upon the adoption of a certain class of words in dental nomenclature, as the conditions are continually changing and it is practically impossible in some instances to

foresee all the difficulties that may subsequently arise in the use of a word.

As an example, one word will suffice. All are familiar with the long, drawn-out discussion of the use of the words "model" and "cast." After so many years the profession has about accepted the word "cast" as preferable to "model", as the word "model" is incorrect in the sense in which it has been so long used in dental literature. Now that "cast" has been accepted, the development of the method of inlay casting has much confused the use of the word "cast", so that now it is quite difficult in some instances to apply the word generally.

There is also much unforeseen difficulty in other phases of dental literature, namely, conforming our nomenclature to that of the other biologic sciences. We cannot afford to disregard the nomenclature of other sciences in forming our own, and, while there are instances in which we have by determined effort succeeded in establishing the use of some words which have conflicted with their use in other sciences, we do not feel that it is worth the effort and the resulting confusion consequent thereto. As examples of the latter, we might cite such words as "articulate," "cuspid," "bicuspid," "mandible," etc. In the case of the last mentioned word it has caused much confusion in anatomical nomenclature for the reason that the nomenclature of the teeth, jaws and surrounding parts has been built around the word "maxillary" applied to both jaws, and the adaptation of mandible has been difficult and thus far not accomplished completely in relation to the anatomical terms given to the parts contiguous to the mandible.

All of this may, however, be avoided if we keep to the suggestion in the forepart of this report, i. e., that our nomenclature be designed to conform to that of the other biologic sciences.

The objection is often raised to so-called hybrid words, i. e., words which have both Greek and Latin derivative root words. This occurs to the committee as being more or less pedantic. The vast majority of the words of our language are of Greek and Latin origin, and such being the case there is no valid reason apparent to the committee why, if the two languages are chosen and preferred as derivative languages, we should not avail ourselves of the advantages to be gained by a combination of the two in forming our words.

Generalizations with regard to nomenclature, its purposes and the best methods of deciding upon terms are all well and good as suggesting principles upon which to work, but we realize that what is most desired particularly is some concrete result reached by the committee. We have therefore and with careful deliberation prepared a list of words which we recommend to the Association for adoption and use in the sense in which we suggest they should be used. We also present some words suggested which do not seem to conform to the intents and purposes of dental nomenclature, and which we recommend be abandoned as promptly as possible.

List of Words Recommended

alveolectomy (L. alveolus + Gr. ektome, excision). Excision of a portion of the alveolar process.

alveolotomy (L. alveolus, + Gr. tome, from temnein, to cut). Incision into the alveolus of a tooth, as for locating the end of a root of a tooth.

anesthesia. Preferable to anaesthesia.

apicoectomy (L. apex, gen. apicis, the end [of a tooth root] + Gr. ektome, excision). The operation of excising the end of the root of a tooth. To be used in preference to apectomy; apiectomy; apicectomy.

artificial denture. Preferable to plate.

cuspid. To be used in preference to canine.

cementum. To be used in preference to cement.

conduction. To be used in preference to conductive, as in conduction anesthesia.

deciduous (adj.) To be used as designating the teeth of the first dentition, in preference to the terms "temporary," "milk" or "baby."

dentural (adj.) (L. dens, dentis, tooth). Relating to the denture.

first molar. To be used in preference to "six-year molar," "sixth-year molar."

mandible (L. mandibula from mandere, to chew). The lower jaw.

maxilla, pl. maxillae (L. maxilla, jaw). The upper jaw.

morsal and occlusal (adj.). To be used synonymously as relating to the masticating surfaces of the bicuspid and molar teeth.

centric occlusion. To be used to express the relation of the inclined planes of the teeth when the jaws are closed in the position of rest.

eccentric occlusion. To be used to express the relation of the inclined planes of the teeth in the excursive movements of the mandible.

mesial and distal. These terms as used today have been objected to as not being in conformity with anatomical nomenclature, where they are used to indicate relation to the median line of the body. They have, however, become so fixed in dental nomenclature that we do not suggest any change.

pathodontia (Gr. pathos, disease + odous, tooth). That branch of dentistry which has for its purpose the study and treatment of diseases of the teeth.

pathology (Gr. pathos, disease + logos, treatise). That branch of medical science which treats of morbid conditions, their causes, symptoms, etc. This term is being loosely used to indicate a disease or pathologic condition, which is confusing, unnecessary and undesirable.

pediadontia (Gr. pais, paidos, child + odous, tooth). That branch of dentistry which has for its purpose the study and treatment of children's teeth and mouth conditions.

periodontia (Gr. peri, around, + odous, tooth). That branch of dentistry which has for its purpose the study and treatment of diseases occurring around the teeth and their roots.

periodontal (Gr. peri, around, + odous, tooth). Relating to the alveolo-dental ligament. To be used in preference to peridental.

periodontoclasia (Gr. peri, around + odous, tooth, + klassis, breaking [down]). The destructive degeneration of the tissues about the root of a tooth. Substituted for pyorrhea alveolaris; Riggs' disease; interstitial gingivitis.

periclasia (Gr. peri, around, + klassis, breaking [down]). Used as a shortening for convenience of periodontoclasia. Should be used with a qualifying word, as in itself it does not mean anything in particular.

pontic (L. pons, pontis, a bridge). (adj. and noun.) A substitute for a natural tooth. Used in preference to dummy.

bicuspid. To be used in preference to premolar.

prosthesis (n.) (Gr. pros, to, + tithenai, to place). Preferable to prothesis. (Because of the more definite application of the Greek preposition pros, as compared to pro, in this form.)

prosthetics (n.). Preferable to prothetics. (For same reason as in prosthesis.)

pulpless tooth. To be used in preference to "dead tooth," "devital tooth," "devitalized tooth." In cases where there is a "vital" pulp in a tooth or a "non-vital" pulp, it should be so designated; e.g., a tooth with a vital pulp, or a tooth with a non-vital pulp.

radiology (n.) (L. radius, ray + Gr. logos, treatise). The science of radiant energy. To be used as the generic term to indicate radiant energy from whatever source.

radiogram (n.) (L. radius, ray, + Gr. gramma, a writing). The product or tangible result, as the film or the print thereof, of the radiographic process, actuated by radiant energy of whatever source.

radiograph (verb) (L. radius, ray, + graphein, to write). The act or process of making a radiogram.

radiography. The art of making radiograms.

radiopaque (L. radius, ray, + opacus, shady). Term applied to a substance that is impermeable to the various forms of radiant energy.

radiolucent (L. radius, ray + lucere, to shine). Term applied to substances that allow the passage of radiant energy light, but offer some resistance.

radioparent (L. radius, ray + parere, to appear). Term applied to substances that freely transmit the light of radiant energy.

Roentgen ray. To be used in preference to X-ray, and only where the specific ray is indicated.

roentgenology. The study and use of the Roentgen ray in its application to medicine and dentistry.

roentgenography. The art of making roentgenograms.

roentgenogram. The shadow picture produced by the Roentgen ray on a sensitized film, or the print from the film.

roentgenograph (v.) The act of making a roentgenogram.

second molar. To be used in preference to "twelve-year molar," or "twelfth-year molar."

third molar. To be used in preference to "wisdom tooth."

Vincent's infection. To be used to express the ulcero-membranous stomatitis caused by Vincent's spirillum and fusiform bacillus; in preference to Vincent's angina; the latter being more applicable to the throat infection.

x-ray (n.) This word is used indiscriminately as a noun and verb. It should not be used as a verb. The word Roentgen ray is preferable. It should also be used with small x rather than with the capital X, if used at all.

penetology; odontalysis. These two words have been suggested, the first to mean the science of radiant energy, and the latter, examination of the teeth. We see no justification for these two words either etymologically or otherwise.

The committee is pleased to state that in the near future there will be available places of accessible record of the activities in the field of dental nomenclature that have not been open to the profession since the passing of Harris' Dental Dictionary. If the present plans mature as proposed there will soon be issued no less than three dictionaries devoted to dentistry, namely, one compiled by Dr. W. B. Dunning, under the auspices of the American Institute of Dental Teachers; one compiled under the direction of Dr. Louis Ottofy, of Chicago, and a third compiled by the chairman of this committee. The committee and the profession can thus feel assured of a permanent continuing record of their activities along this line in the future.

In concluding the report your committee earnestly solicits the co-operation of committees on Nomenclature and of individuals who are actively interested in this subject, to the end that our nomenclature may be as expeditiously as possible enlarged to meet the needs of the profession.*

Respectfully submitted,

L. Pierce Anthony, *Chairman*,
C. N. Johnson,
Otto U. King,
H. E. Friesell,
H. L. Wheeler,

Committee.

*The House of Delegates by unanimous vote received, adopted and authorized the publication of this report.

Reminiscences of Forty-five Years in Dentistry

By C. N. JOHNSON, M.A., L.D.S., D.D.S., M.D.S., F.A.C.D., Chicago, Illinois

IX

TO SIT with Dr. Black an entire evening away into the small hours, as I have done on many an occasion, and drink in the wondrous lore that came from his lips was like a professional benediction. And it was not only on professional topics that he shone the brightest. He was the most versatile man I have ever known. There was only one thing that I ever saw Dr. Black try to do that he did not do well, and that was drive a horse. And this was the one thing I *could* do. I was brought up with horses and knew them like a book. On one of my visits to Jacksonville Dr. Black took me out for a buggy ride. I soon saw that he knew more about dentistry than he did about driving. If ever a horse roamed at his sweet will that horse did. Dr. Black got so engrossed in talking about filling materials that he forgot all about the fact that he was supposed to be the guiding hand which controlled that horse. All at once the horse started to turn a corner. I said: "Doctor, you don't want to go up that street, do you?" "No," said he, "of course not." And he began sawing away on the lines, to the end that we landed up on the curb. "That pesky horse," said he, "doesn't seem to know *where* he wants to go." But my inward reflection was that the horse seemed to know where he wanted to go better than Dr. Black did. After the drive was over I got out of the buggy with a sigh of relief, and that was the last time Dr. Black ever inveigled me into going for a buggy ride with him. It is true that I carried some insurance but I was not certain that it was sufficient to take care of my family.

It must have been on this same trip that Dr. Black asked me to insert a gold foil filling in a steel die that he had made for the purpose. I did so, and when it was finished he took the die apart and placed the cube of gold under the microscope. I was standing at the window of his office looking out—in fact Dr. Black kept me so busy thinking when I was watching his experiments that it almost made me dizzy, and so I went to that window as often as I could to reflect a bit and pull myself together. He had merely glanced at the gold when I heard him chuckle. "Come here," said he, beckoning with his finger. "Look at this." And as I peered through the microscope he said: "See those lines across the surface of the gold?" I said I did. "Do you know what they are," he asked. I shook my head. I never saw him exhibit greater glee than when he remarked: *"Those are the tiny scratches left in the surface of the steel when it was polished with the emery cloth.* Talk about the possibility of adapting gold to cavity walls after that!" With all his splendid work on amalgam he never lost his admiration and love for gold as a filling material, and I feel sure that those

who have once really mastered its manipulation will agree with him.

After he came to Chicago to live I of course saw him more frequently, and for years every winter we journeyed together to St. Paul, Minn., to attend the midwinter clinic of the G. V. Black Dental Club of that city. I have never known of any organization quite equal to that. It was composed of a relatively small body of the most earnest laborers in the dental profession, headed by that indefatigable worker and master organizer, Dr. E. K. Wedelstaedt. The president was the late Dr. A. C. Searl of blessed memory, and under the guiding hand of these two men that organization did more to spread the gospel of advanced dentistry, as promulgated by Dr. Black, than any other single influence. All honor to that little band of men who labored so faithfully and unselfishly to the end that better dentistry should be done, and the people should be more efficiently served. And all honor to the one man who threw himself so whole heartedly into the work that for years he was constantly on the verge of a nervous collapse through overexertion in his devotion to the best interests of the Black Club and the large body of men who were receiving instruction at their hands. When the record of dentistry in the great northwest shall have been fully written, the name of E. K. Wedelstaedt will loom large among the stalwart men whose selfsacrificing consecration to the uplift of the profession forms one of the most glorious chapters in dental history. It is a great personal pleasure to me, here and now, while the man is still living, but without the slightest intimation on his part that I am venturing to do it, that I pay this well merited tribute to the signal service that Dr. Wedelstaedt has rendered his profession and his fellowman.

These midwinter meetings were of the most strenuous character. Men gathered from all over the country, and I deem it one of the greatest honors of my professional life that in all the years they were held I never once failed to receive an invitation to take part in the program. Dr. Wedelstaedt usually outlined in advance the subjects he wished covered by Dr. Black and myself and we endeavored to do the best team work of which we were capable. By the time each meeting was over we were both pretty thoroughly worn out. Dr. Black in particular would always come home from the meetings desperately tired, and yet greatly pleased with the progress which he felt sure had been made.

I shall never forget one experience. During the meeting Dr. Black was taken ill at the hotel, and was unable to give his last lecture. He had worked very hard—in fact he aways overexerted himself at these meetings. I was pressed into service to take his place, and this on top of my regular part in the program made an exceedingly full day for me. As I reached the hotel after the lecture I found Dr. Wedelstaedt pacing the parlor off Dr. Black's bedroom in the greatest excitement. I asked him what was the matter. "*That is the most stubborn man I ever saw,*" said Dr. Wedelstaedt, pointing toward the bedroom. "He is determined to start for home tonight, and he is no more fit to travel than I am to fly to the moon."

And truly Dr. Black looked very ill. He was naturally rather pale, and on this occasion he looked unusually white and really emaciated. But as Dr. Wedelstaedt had said, he had his mind set on going home, and no influence on earth could prevent him. We bundled him into a cab, and put him to bed in a compartment of the Chicago sleeper. I had the adjoining compartment, and as the train began to pull out Dr. Wedelstaedt put his arm around me and said: "Old man, I don't envy you this trip. You will never get him to Chicago alive."

I was greatly concerned myself, because in all my association with Dr. Black I had never seen him look like that before.

He lay in the berth just where we had placed him without apparently making the slightest movement—a picture of the most utter exhaustion. I left the door open between our compartments and all through the night every few minutes I went to the door to see how he was. Not a move did he make as hour after hour passed, and I finally went close to his berth to make sure that he was breathing. Seemingly he was sleeping quietly and peacefully. At 4:30 in the morning through sheer fatigue I dropped off to sleep, and awakened at 6 with a start. I jumped to my feet and went to the door, with a guilty feeling that I had slept at my post. What was my amazement to find Dr. Black sitting up *smoking a cigar!*

I think I must have sworn at him—at least I felt like it. I can recall winding up with the mild imprecation: "Blast your hide—you had me nearly scared to death." He looked up at me with that quizzical almost roguish smile that sometimes broke over his countenance, and blowing a cloud of smoke, merely remarked: "I knew I would be all right as soon as I got away from those Indians up there."

Speaking of smoking reminds me that Dr. Black was one of the most inveterate smokers I have even known. Sitting with him of an evening he constantly puffed away at his cigar, always lighting a fresh cigar on the stub of the old one. He often seemed to do this as unconsciously as he breathed. I recently asked his son, Dr. Arthur Black, if he ever knew just how many cigars his father smoked during a day. His answer was that it was difficult to estimate—that his father kept boxes of cigars in different places where he could reach for them at will—but as nearly as he could make out his father averaged about one hundred and twenty-five cigars a week.

The nearest I ever saw him absolutely disgusted with me was one evening when I declined a proffered cigar. I had been in the habit of smoking one small cigar after dinner at night, but finally concluded that it did me no good and stopped. The next time I saw him he offered me a cigar. I declined as gently as I knew how. He turned his cigar over in his fingers and said: "I know they are not very good cigars, but light one of your own." I dreaded the next development, but as apologetically as I could I informed him that I had stopped smoking. *"Stopped smoking!"* he exclaimed. "Well—I have stood a great many things from you, but this is the last straw. *I have no further use for you after this.*" During the rest of the evening I felt much like a naughty boy who had been properly upbraided.

Dr. Black's love of nature was one of his dominant passions. I have spoken of his diversified talent, and in no particular was this better illustrated than in his marvelous insight into the mysterious processes of nature. He knew the woods and fields and birds and beasts of the wild like an open book, and never tired of talking about them. For years his vacations were spent sailing the upper part of Lake Michigan and the Georgian Bay. He sailed in a small 16-foot boat that he designed and built himself. He has told me of weathering many a severe storm in that boat—in fact he said there was no danger in the worst storm provided a man knew how to handle the *boat* and had the endurance to outlast the storm.

Dr. Black dearly loved a joke—even if sometimes it chanced to be on himself. On one of his vacations with his son Arthur he was standing on a rock in midstream and suddenly slipped in and got a ducking. Arthur saw me on their return home and said: "I want you to joke Father when you see him," and told me the circumstance. I met him a few days later and without any other salutation I said: "You remember the old Biblical quotation, 'the wicked stand in slippery places'?" He was suspicious of me at once, but finally admitted that he did remember it. "Well," said I,

"there has been a revision of it." He looked at me a moment inquiringly—still suspicious—and asked what the revision was. I answered: "It now reads 'the wicked *slip* in slippery places'." He suddenly made for me with a twinkle in his eye as he caught the connection and said: "*Somebody has been tattling to you.*"

Whether or not Dr. Black believed in dreams I do not know but he was most intensely interested in them, and frequently regaled me with a recital of his dreams, some of which were wild and weird enough for the most exciting storybook. They were mostly of his adventures with wild animals, and in his analysis of the predicaments in which he sometimes found himself it was hard to determine whether he was reciting a dream he had in his sleep or one of his waking dreams. I am convinced that if Dr. Black had not devoted his energies to the investigation of scientific subjects he might have entertained the world most delightfully with his stories. There were more sides to him than to any man I have ever known.

Besides this he had so many delightful little peculiarities that he was interesting every moment. For instance, he never kept the upper part of his vest buttoned. You might go up to him and button that vest a dozen times a day, and the moment your back was turned it was unbuttoned. I do not believe he could have told you why he did it. Then in winter he seldom knew whether or not his overcoat was buttoned. I have seen him go out in the coldest weather with his overcoat flying open, and when you called his attention to it he would probably button one or two buttons, and get busy talking and forget the others. I have rather vigorously taken him in hand many a time and buttoned his overcoat for him. This developed the habit on my part when we two were together of calling him "the kid," and he seemed to enjoy it so much that he retaliated by calling me "the old man." Whenever we two met without the presence of a third party it was aways: "How is the kid today?" And, "How is the old man?" Ah me, what delightful days those were!

Speaking of his absent-mindedness when engrossed in a scientific subject reminds me of an occurrence in St. Paul when we were attending one of the Black Club meetings. He was to talk on the subject of dental caries, and he wanted to illustrate his point in such a way that it would never be forgotten. Taking me by the arm he said: "I want you to come with me." He led me to a grocery store where he asked to see some apples. The clerk pointed to a basket of apples and asked how many were wanted. Dr. Black sat down by the basket and began sorting them over and said to me: "I want to pick out some with beginnings of decay in them, and I want the *right kind* of decays. I want to illustrate the process by which decay begins and by which it progresses." And he picked up one apple after another and cut into it only to discard it when the decayed spot did not suit him. It was midwinter and apples were costly, but he seemed as utterly oblivious to this feature of the situation as if there were a million apples lying there and the groceryman was begging him to carry them away. What he was after was the *right kind* of a decayed apple, and he kept on till he found it. When he was through there was a pile of discarded apples lying on the floor—of course ruined for sale. During the process the clerk had at times eyed Dr. Black somewhat suspiciously, but I caught his eye and nodded to assure him it was all right—that the gray haired man was not a lunatic, as he evidently suspected. I would have reached the clerk and paid the bill if it had been possible to do so without Dr. Black's knowledge, but as it was I had to turn away and refuse to listen to the painful particulars as Dr. Black put his hand in his pocket for the money. We walked out, Dr. Black hugging his coveted two or three apples, and I doubt if he could have

told in five minutes what he had paid for the pile of apples on the floor.

In the summer of 1915 I injured my leg. My physician permitted me to go to my office, but ordered me to keep quiet otherwise, and lie down with my leg on a level with my body as much of the time as possible. I had heard that Dr. Black was not well, but was prevented from going to see him on account of my leg. One day when I was somewhat better I called Dr. Back's home by telephone to say that I was coming to see him that evening. His daughter informed me that he had left the day before for his vacation. "But," said she, "as soon as he returns I will let you know so you may come to see him because I know he would like a visit with you."

I left for Canada shortly after this to rest up my injured leg, and take my vacation. One day I received a telegram from Dr. F. W. Gethro giving me the startling intelligence that Dr. Black had died, and was to be buried in Jacksonville, Illinois, on a certain day. I wired back that I was leaving at once for Chicago. I figured that I could reach Jacksonville in time for the funeral, but in my confusion I failed to recall how far Jacksonville was from Chicago. On the train between Toronto and Chicago I got access to a folder and soon learned that it was impossible for me to make it. Thus I reached Chicago the morning of the day Dr. Black was to be buried in Jacksonville—too late to make connections.

The disappointments—first of not seeing him before he left Chicago, and second of not being privileged to pay my respect to his memory at the funeral—have been a source of sorrow to me ever since, and yet, mayhap it is just as well. Mayhap my vision of him is more fortunate than if I had seen him when he was beginning to falter and drift toward the brink. As it is I can recall him most vividly when he was the mental colossus of the dental profession, solving its problems one after the other with that marvelous intellect with which he was so richly endowed, and working so unremittingly day after day and night after night that the toll of disease might be less. Mayhap as the shades of midnight close around me while I write these lines it is better that the uppermost thought in my mind is of his glorious achievements, and his great activities; rather than that I should see him begin to grope a little in the shadows to find where he might lay down his books, his manuscript, and his beloved instruments. And thus I must be content.

In that wondrous realm where great and noble souls reach out the helping hand to succor their suffering fellowman; where deep devotion turns the treacherous tide of sin and sickness and sorrow; where nature in her myriad moods plays comrade with the sons of men; where the miracles of the unseen world are mirrored across the canopy of heaven; where the light breaks in through the darkest dawn and flashes a signal of hope for the coming day; where work is its own and best reward, and the surcease comes only when the deed is done; where science and art and sacrifice and service, and rhythm and rhyme, all mingle with the music of the spheres—there dwells the spirit of Greene Vardiman Black.

(*To be continued*)

THE JOURNAL of the AMERICAN DENTAL ASSOCIATION

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VOL. 9 SEPTEMBER, 1922 NO 9

Editorial Department

THE LOS ANGELES MEETING

The 1922 meeting of the Association will go down in history as one of achievement. As announced in our August issue the name was changed from the "National Dental Association" to the "American Dental Association"—the name originally held by this organization. This change of name involved a most magnanimous concession on the part of a very important and influential section of our membership, viz. the men from the South. In the earlier days there were two great organizations—the American Dental Association, and the Southern Dental

Association. This latter association was very dear to the hearts of the men of the Southern states, and when the time came that it was apparent that one large and representative body could work to better advantage than two, and when the suggestion was made to amalgamate the American and the Southern, these Southern men felt that the only logical thing to do was to change the name of the new organization rather than to continue either of the names already in use. Thus the compromise was made on the name "National", and it has functioned under that title ever since. But the name "National" was not in all respects a satisfactory one. It did not designate which nation, and it lacked the distinctiveness which has always attached itself to such organizations, as the American Medical Association, the British Dental Association, etc.

Therefore in recent years the sentiment has been taking form in the minds of those who have at heart the best interests of the organization, in favor of changing the name back to that of the American Dental Association. When this matter was broached, let it be said to the everlasting honor of those superb men of the South that they acquiesced most graciously, and in fact one of their number, Dr. S. W. Foster, of Atlanta, Ga., made a speech at Los Angeles favoring the change. This may be taken as indicative of the splendid unanimity and cohesion which characterizes the profession at the present time from one end of the land to the other, and on account of this sentiment we confidently look forward to greater and still greater achievement on the part of this the representative dental organization of the great American nation.

The next outstanding feature of the Los Angeles meeting was the Public Health Exhibit, which was staged in a separate tent erected for this purpose. This represented the various plans for educating the public on matters pertaining to oral hygiene, and showed what was being done in different localities in this direction. The dental equipment of the army, and the *modus operandi* of conducting army dental service was also shown. To go through this entire exhibit one could easily imagine that President Hartzell's slogan "Dentistry can add ten years to human life" might readily become a fact.

Another advance made at this meeting was the adoption of a new Code of Ethics. This embodies a provision of which it might be well for our members to take particular note. Section III reads as follows: "*It is unprofessional for dentists to pay or accept commissions on fees for professional services, or for radiograms or on prescriptions or other articles supplied to patients by pharmacists or others.*" Hereafter every man who becomes a member of the American Dental Association throughout the far-flung breadth of the land subscribes to this provision, and may be expelled from membership for violating it. We believe that this one section of the new Code has a more far-reaching significance,

and a greater power for good than can be realized today, and that it will go a long way toward establishing the profession on a high ethical plane.

The principle of reciprocity between the states received an impetus through the adoption of resolutions favoring this idea, and the appointment of a committee to study reciprocal relations, and to cultivate a sentiment in favor of it.

The report of the Committee on Nomenclature was most ably presented by the chairman, Dr. L. P. Anthony, of Philadelphia, and the committee was continued for further work. It would thus seem that our nomenclature is at last in a fair way to receive a thorough overhauling, and we may confidently look forward to greater system and unity in our dental terms.

The address of Mayor William Hale Thompson, referred to in our August issue, on community dental service in Chicago was presented at a mass meeting in Trinity Auditorium, and was most enthusiastically received.

All in all, the 1922 meeting inaugurated some very important advances in our professional progress, and registered a distinct gain in our association efforts. In addition to which it is a pleasure to record the very delightful entertainment meted out by the Los Angeles dentists, which never faltered from the moment the first train brought in its contingent till the last echo of the meeting gradually faded away.

PETITION FOR INCORPORATION OF THE AMERICAN DENTAL ASSOCIATION

(Paid June 19, 1922, $10.00.—R. B. P. Fee $10.00.)

State of Illinois, Cook County, ss.

To LOUIS L. EMMERSON, Secretary of State:

We, the undersigned, Thomas B. Hartzell, Otto U. King, C. W. Hall and W. H. G. Logan, citizens of the United States, propose to form a corporation under an Act of the General Assembly of the State of Illinois entitled, "An Act Concerning Corporations," approved April 18, 1872, and all acts amendatory thereof; and for the purpose of such organization we hereby state as follows, to-wit:

1. The name of such corporation is American Dental Association.

2. The object for which it is formed is:

THE PARTICULAR OBJECTS OF THIS ASSOCIATION SHALL BE: To cultivate and promote the art and science of dentistry, and of its collateral branches; to conduct, direct, encourage, support or provide for exhaustive dental and oral research; to elevate and sustain the professional character and education of dentists; to promote among them mutual improvement, social intercourse, and good will; to disseminate knowledge of dentistry and dental discoveries; to enlighten and direct public opinion in relation to oral hygiene, dental prophylaxis, and advanced scientific dental service, and in relation to the advantages and progress of enacting

and enforcing proper, just and uniform dental laws in the several states; and collectively to represent, have cognizance of and to safeguard the common interests of the members of the dental profession; with express power to acquire property for the purposes of the Corporation by purchase, deed, gift, bequest, or otherwise, and to hold and administer the same, and to publish dental journals, reports or treatises.

3. The management of the aforesaid American Dental Association shall be vested in a board of thirteen directors.

4. The following persons are hereby selected as the directors to control and manage said corporation for the first year of its corporate existence, viz:

Thomas B. Hartzell, 716 Donaldson Bldg., Minneapolis, Minn.; John P. Buckley, 1550 Hayworth Ave., Los Angeles, Cal.; Otto U. King, 5 N. Wabash Ave., Chicago, Ill.; R. E. Volland, Iowa City, Iowa; C. C. Allen, Tenth and Troost, Kansas City, Mo.; John D. Millikin, Elkan-Gunst Bldg., San Francisco, Cal.; Thomas P. Hinman, Fourth National Bank Bldg., Atlanta, Ga.; H. J. Burkhart, 300 Sibley Blk., Rochester, N. Y.; C. W. Hall, Alhambra Bldg., Milwaukee, Wis.; Waldo E. Boardman, 519 Boylston St., Boston, Mass.; Clarence J. Grieves, 201 Madison St., Baltimore, Md.; Carl D. Lucas, 902 Hume-Mansur Bldg., Indianapolis, Ind.; Arthur R. Melendy, Holston National Bank Bldg., Knoxville, Tenn.

5. The location is in the city of Chicago in the County of Cook in the State of Illinois, and the post office address of its business office is at No. 5 North Wabash Ave., in the said city of Chicago, Illinois.

SIGNED,

THOMAS B. HARTZELL,
OTTO U. KING,
C. W. HALL,
W. H. G. LOGAN.

State of Illinois, Cook County, ss.

I, Betty V. Borris, a Notary Public, in and for the County and State aforesaid, do hereby certify that on this tenth day of June A. D., 1922, personally appeared before me Thomas B. Hartzell, Otto U. King, C. W. Hall and W. H. G. Logan, to me personally known to be the same persons who executed the foregoing certificate, and severally acknowledged that they had executed the same for the purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and seal the day and year above written.

(SIGNED) BETTY V. BORRIS,
Notary Public.

(Betty V. Borris, Notary Public, Cook County, Ill.)

Filed June 19, 1922, Louis L. Emmerson, Secretary of State.

INCORPORATION OF THE AMERICAN DENTAL ASSOCIATION*

Certificate Number 5379

STATE OF ILLINOIS

Office of

The Secretary of State

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETING:

WHEREAS, a Certificate, duly signed and acknowledged has been filed in the

*Copy of Articles of Incorporation, filed June 20, 1922, No. 7547608, Recorder's Office, Cook County, Illinois.

Office of the Secretary of State, on the 19th day of June, A. D., 1922, for the organization of the

AMERICAN DENTAL ASSOCIATION

under and in accordance with the provisions of "An Act Concerning Corporations" approved April 18, 1872, and in force July 1, 1872, and all acts amendatory thereof, a copy of which certificate is hereto attached:

Now Therefore, I, Louis L. Emmerson, Secretary of State of the State of Illinois, by virtue of the powers and duties vested in me by law, do hereby certify that the said

AMERICAN DENTAL ASSOCIATION

is a legally organized Corporation under the laws of this State.

IN TESTIMONY WHEREOF, I hereto set my hand and cause to be affixed the Great Seal of the State of Illinois.

(Seal of the)
(State of)
(Illinois)
(August 26,)
(1818.)

Done at the City of Springfield this 19th day of June, A. D., 1922, and of the independence of the United States the one hundred and 46th.

(Signed) LOUIS L. EMMERSON,
Secretary of State.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Public Health Association, October 16-19, Cleveland, Ohio.

STATE SOCIETIES

September

Delaware, at Wilmington (14).

October

New England Dental Society, at Boston, Mass. (26, 27, 28).

Northern Illinois, at Rockford (18-19).

Northern Indiana, at Wabash (2, 3).

Susquehanna Dental Association of Pa., at Scranton (25, 26, 27).

Virginia, at Richmond (18-21).

December

Ohio State Dental Society, Cincinnati (7, 8, 9).

March (1923)

Michigan, at Detroit (27, 28, 29, 30, 31).

May

New York, New York City (9, 10, 11, 12).

Pennsylvania, Philadelphia (8, 9, 10).

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

Massachusetts, at Boston, October 3, 4, 5 and 6. Secretary, J. N. Carriere, 146 State House, Boston.

Michigan, at Dental College, Ann Arbor, November 13 to 18 inclusive. Secretary, E. O. Gillespie, 745 David Whitney Building, Detroit.

NEW ENGLAND DENTAL SOCIETY

The twenty-eighth annual meeting of the New England Dental Society will be held at the Harvard University Dental School, Boston, Mass., October 26, 27 and 28, 1922.

ALVIN A. HUNT, *Secretary*,
902 Main St., Hartford, Conn.

MICHIGAN DENTAL EXAMINATION

The next examination to be held in this state for those seeking license to practice dentistry in Michigan will be held in the city of Ann Arbor, at the dental college, November 13 to 18 inclusive. All information relative to credentials, blanks, etc., may be had by addressing,

DR. E. O. GILLESPIE, *Secretary*,
745 David Whitney Bldg., Detroit.

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

The Massachusetts Board of Dental Examiners will hold an examination October 3, 4, 5 and 6. Applications for this examination should be on file at Room 146, State House, Boston, at least ten days in advance of examination.

J. N. CARRIERE, *Secretary*,
146 State House, Boston.

ALABAMA BOARD OF DENTAL EXAMINERS

The Board of Dental Examiners of Alabama would call your attention to one of its new requirements of applicants for license certificates; effective at the annual examination, beginning June, 1923, which reads as follows:

Upper, fixed, sanitary bridge will be substituted for inlay, to consist of three-quarter or hood crown on cuspid and three-quarter crown on first molar, with sanitary pontics or dummies, to be waxed up in occlusion but not soldered, and to be mounted on typodont or extracted teeth, properly set in plaster models and mounted on articulator. All work including preparation of abutments, to be done before the board, except, that if porcelain root tips are used on pontics or dummies, they must be baked before coming to the examination.

We would again call your attention to an appeal which we sent out in 1919 which reads as follows:

"This appeal is directed by the State Board

of Dental Examiners of Alabama to the recognized dental colleges of the United States.

"In the light of present-day knowledge, it seems to us but little short of criminal that the schools in many instances are graduating men with such a vague idea of the awful effects of focal infection resulting from improper root-canal technique.

"So much secondary disease originating from focal infection makes it absolutely necessary, that if root-canal technique is to be taught at all, then the most approved, modern methods should be taught, not only in lectures, but should be practiced rigidly in the infirmary.

"In this connection, it is deplorable that in many instances we find recent graduates going out mentally equipped to practice obsolete methods and we respectfully suggest that those colleges which have not already done so, will establish a chair bearing the same relation to dental surgery that the chair of current literature bears to the academic course in the various colleges and universities.

"With no intent to embarrass and with only the good of the public and the right of recognition of the profession in mind, this appeal is respectfully submitted."

The board has observed some improvement in the applicants which have come before it but we wish again to urge that those colleges that teach root-canal filling do so with a rigid observance of the strictest asepsis, both in the clinic and didactic departments.

H. CLAY HASSELL, D.D.S.,
Secretary-Treasurer.

THE AMERICAN ACADEMY OF PERIODONTOLOGY

The ninth annual meeting of the American Academy of Periodontology will be held at the Hotel Gibson, Cincinnati, Ohio, December 4-6, 1922. The Academy will furnish the Wednesday evening program for the general session of the Ohio State Dental Society, which will hold its annual meeting December 5-7, 1922. The Academy members are invited to attend the meetings of the Ohio State Dental Society.

J. HERBERT HOOD, *Secretary,*
Cleveland, Ohio.

RESOLUTIONS PASSED BY NATIONAL RESERVE OFFICERS

We, the medical, dental, veterinary, medical administrative officers of the Medical Department Reserve Corps, United States Army of the Fourth Corps Area, on active duty at Camp McClellan, Alabama, July 12 to 26, 1922, for the purpose of field training, being in meeting assembled and desiring to express our appreciation for the training and courtesy shown be it resolved:

First, That we tender to surgeon general and subordinates, to the Commandant Organized Reserve Corps, Camp McClelland and subordinates, particularly camp surgeon and his staff of trained instructors our sincere appreciation and thanks for the competent manner in which the technical instruction was given and courtesies shown.

Second, That we go on record as endorsing this plan of training for medical officers and hope that steps will be taken to procure the necessary funds to extend training in the future to a larger number.

Third, That we are unanimously opposed to the initial appointment of officers in the Medical Reserve Corps above the grade of first lieutenant, who were not on active duty during the World War.

Fourth, That we are further opposed to any policy that places restrictions such as age, etc., or attendance at camp and any other restrictions of medical officers' promotions which are not placed on promotions of reserve officers in the line. Attention is respectfully invited to the fact that medical officers are in civilian life practicing every day their branches, and those officers of the nontechnical branches are not practicing the form of duty upon which they will be called to function in time of war.

Fifth, That copy of these resolutions be submitted to the Surgeon General (through camp surgeon) and Camp Commandant, Camp McClellan, Alabama, also that copy be furnished the Journal of the American Medical Association, Southern Medical Journal, Journal American Military Surgeons, American Hospital Journal, American Pharmaceutical Journal, Journal of the American Dental Association, Military Dental Journal and American Veterinary Journal.

L. H. WEBB, MAJOR, M.O.R.C., *Secretary,*
New Orleans, Louisiana.
F. M. HARBIN, MAJOR, M.O.R.C.,
Columbia, South Carolina.
F. M. BOYETTE, CAPTAIN, M.O.R.C.,
Oneida, Tennessee.
L. H. BREVARD, FIRST LIEUT., M.O.R.C.,
Hernando, Mississippi.

THE SANTA FE RAILROAD SYSTEM COMMENDED BY THE PASSENGERS ON THE DENTAL SPECIAL

On Board Dental Special,
En Route Los Angeles,
July 13, 1922.

At a social gathering of the members and their wives, held in the club car and attended by representatives of the 218 passengers from the different cars, it was the unanimous sen-

timent that a letter should be sent to the officials of the Santa Fe Railroad to express our appreciation of the efforts made for our comfort.

Resolved, That the service and courtesy extended by the management of the Santa Fe Railroad to its passengers on the Dental Special far exceed any previous experience traveling to and from the meetings of the Dental Association.

That the untiring efforts and most efficient service rendered by Mr. A. C. Devlin and his charming wife have made the trip a most enjoyable one.

That Mr. R. W. Nieman, the pullman conductor, has done everything possible to make the journey a pleasure.

That the stewards of the dining cars and their aids have far exceeded the usual service on transcontinental trains. Therefore, be it

Resolved, That we owe a debt of gratitude to these employees of your company, and take this method of expressing our thanks to the officials of the Santa Fe System for a most delightful trip from Chicago to Los Angeles.

Resolved, That a copy of this letter be sent to the president of the Santa Fe, the district passenger agent, Mr. J. R. Moriarty, the Pullman Company of Chicago, the Fred Harvey Company of Kansas City, Mr. Devlin, Mr. Nieman, and to the Journal of the National Dental Association.

SIGNED

H. J. Burkhart, Rochester, N. Y., Director Eastman Dental Dispensary.
E. F. Hazell, Springfield, Ill., Pres. Illinois State Dental Society.
H. B. Pinney, Chicago, Ill., Pres. Chicago Dental Society.
G. L. Moore, Girard, Ohio.
J. E. Weaver, Milwaukee, Wis.
William F. Whalen, Peoria, Ill.
F. E. Cobb, Minneapolis, Minn.
W. H. Richards, Knoxville, Tenn.
J. W. Ames, Evansville, Wis.
L. L. Davis, Chicago, Ill.
J. M. Marton, Buda, Ill.
Mrs. G. L. Moore, Girard, Ohio.
Mrs. J. W. Ames, Evansville, Wis.
Charles Proctor, Boston, Mass.
Dr. and Mrs. J. R. Blayney, Chicago, Ill.
T. W. Kelton, Greenwood, Ark.
Dr. and Mrs. C. W. Hodgman, Princeton, Ill.
Edwin R. Talbot, Joliet, Ill.
J. D. Talbot, Joliet, Ill.
Mrs. Clara S. Proctor, Boston, Mass.
W. E. Neuenschwander, Fort Wayne, Ind.
H. W. Neuenschwander, Berne, Ind.
Alfred P. Lee, Philadelphia, Pa.
William McCandless Lee, Philadelphia, Pa.
Dr. and Mrs. C. G. Parker, Detroit, Mich.
F. E. Roach, Chicago, Ill.
Mark E. Vance, Lincoln, Nebr.
Sarah Vance, Lincoln, Nebr.
Edith H. M. Lee, Philadelphia, Pa.
Harry E. Radix, Chicago, Ill.
W. T. Reeves, Chicago, Ill.
F. C. Martin, Rochester, N. Y.
George E. Lindmark, Chicago, Ill.
E. R. Sandford, New York City.
Agnes I. Polhamus, New York City.
Mrs. Chalmer J. Lyons, Ann Arbor, Mich.
Chalmer J. Lyons, Ann Arbor, Mich.
J. H. Wallace, Omaha, Nebr.
S. A. Allen, Loup City, Nebr.
Carl R. Lindstrom, Boston, Mass.
William H. Eaton, Boston, Mass.
Miss Carrie Walden, Waterbury, Conn.
Miss Ruth Walden, Waterbury, Conn.
Mrs. W. H. Eaton, Boston, Mass.
Dr. and Mrs. A. S. Blake, Wauseon, Ohio.
Dr. and Mrs. V. W. Hunt, Piqua, Ohio.
Dr. and Mrs. Earle S. Smith and Family, Iowa City, Iowa.
Dr. and Mrs. Ralph Lambert, West Milton, Ohio.
Dr. W. F. Campbell, Buffalo, N. Y.
Evelyn C. Schmidt, Boston, Mass.
F. H. Waldron, Dover, Ohio.
J. A. Waas, Hammonton, N. J.
W. H. Gelston, Camden, N. J.
Frank C. Perl and Family, Chicago, Ill.
D. P. Normoyle and Family, Chicago, Ill.
Dr. T. A. Hardgrove and Family, Fond du Lac, Wisconsin.
J. A. McArthur and Wife, Chicago, Ill.
Dr. and Mrs. E. C. Pendleton, Chicago, Ill.
Annie B. West, Chicago, Ill.
George N. West, Chicago, Ill.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT

NAVY

Lieutenant H. R. Alexander, naval training station, Hampton Roads, Va.; to receiving barracks, Hampton Roads, Va.

Lieutenant H. C. Wickham, naval station, Guam; to R. S., San Francisco.

Lieutenant C. T. Lynes, navy yard, Portsmouth, N. H.; to naval station, Guam.

Lieutenant John Haas, to naval hospital, Washington, D. C.—*Army and Navy Register,* July 8, 1922.

Lieutenant Max Cohen, marine barracks, Parris Island; to marine barracks, Quantico, Va.

Lieutenant Hyman Mann, marine barracks, navy yard, Philadelphia; to marine barracks, Quantico, Va.

Lieutenant D. L. Chamberlain, from Buffalo to Yangzte patrol.—*Army and Navy Register,* July 15, 1922.

Lieutenant Commander L. C. Williams, Eagle 11; to Ortolan.

Lieutenant W. F. Minnowitz, Eagle 11; to Ortolan.

Lieutenant F. V. Davis, Eagle 11; to Ortolan.

Lieutenant L. B. Lippmann, navy yard, New York; resignation accepted.—*Army and Navy Register,* July 22, 1922.

Lieutenant J. A. Kelly, naval training station, Hampton Roads, Va.; to navy yard, Portsmouth, N. H.

Lieutenant J. A. Walsh, naval training station, Great Lakes, Ill.; to marine expeditionary force, Haiti.

Lieutenant C. S. Weigester, marine expeditionary force, Santo Domingo; to receiving barracks, Hampton Roads, Va.

Lieutenant J. E. Morgan, Eagle 33; to Chewink.

Lieutenant C. H. Morris, orders revoked; continue at receiving barracks, Hampton Roads, Va.

Lieutenant Commander C. H. Mack, naval dispensary, Washington; to Pittsburgh.—*Army and Navy Register,* July 29, 1922.

Lieutenant Commander G. H. Reed, naval training station, Great Lakes, Ill.; to bureau of medicine and surgery, Navy Department.—*Army and Navy Register,* August 5, 1922.

Lieutenant R. S. Davis to treatment naval hospital, League Island, Philadelphia, Pa.

Lieutenant L. J. Dupuy, hospital corps training school, Norfolk, Va.; to duty marine expeditionary force, Santo Domingo.

Lieutenant R. E. Farnsworth, Baltimore; to mine squadron 2, Pacific fleet.

Lieutenant J. E. Morgan, Eagle 33, resignation accepted.

Lieutenant H. A. Badger, naval hospital, Charleston, S. C.; to marine barracks, Parris Island, S. C.

Lieutenant R. P. Morse, marine barracks, Quantico, Va.; to duty marine expeditionary force, Port-au-Prince, Haiti.—*Army and Navy Register,* August 12, 1922.

The following promotions in the Navy are announced:

Following lieutenants appointed passed assistant dental surgeons in Navy with rank of lieutenant from July 1, 1920: A. L. Burleigh and R. H. Fladeland.

To be passed assistant dental surgeons: E. G. Hoylman and J. A. Kelly.

ARMY

Lieutenant Colonel Minot E. Scott from duty in Panama Canal Department, effective upon completion of present tour of foreign service, and upon arrival in United States will report to commanding general 9th corps area for assignment to duty and station.

Lieutenant Colonel Albert R. White from duty at general intermediate depot, Brooklyn, will sail on transport to leave New York City about November 23 for Panama Canal Department for duty.

Major Joseph H. Tyler report to retiring board at Fort Bliss, Tex., for examination.

Captain Robert E. Motley, having been found by an Army retiring board incapacitated for active service on account of disability resulting from wound received in battle, his retirement from active service is announced; proceed home.—*Army and Navy Register,* July 8, 1922.

Captain Jerome L. Fritsche from duty at Presidio of San Francisco to Scott Field, Ill., for duty.—*Army and Navy Register,* July 22, 1922.

Colonel Alden Carpenter, now on duty in office of attending surgeon, Washington, will report at Walter Reed General Hospital, D. C., for observation and treatment.

Captain Charles L. Andrews, having been found by an Army retiring board incapacitated for active service on account of disability incident thereto, his retirement from active service is announced; proceed home.

Captain Richard F. Thompson from duty at Camp Knox, Ky., to Camp Humphreys, Va., for duty.

Resignation by Captain Frederick W. Herms, to take effect August 3, is accepted.

The following relieved from duty at places specified are assigned to station at army dental school, Washington, will proceed to Carlisle Barracks, Pa., and report at medical field service school September 1 for four months' course of instruction, and to Walter Reed General Hospital for course of instruction at Army dental school; Captains Lawrence K. Anderson, Fort Benjamin Harrison, Ind.; Arthur E. Brown, Camp Humphreys, Va.; Thomas F. Davis, Camp Bragg, N. C.; James B. Harrington, Fort Jay, N. Y.; Clarence W. Johnson, Fort Bliss, Tex.; Daniel S. Lockwood, Chanute Field, Ill.; Arthur B. McCormick, Fort Williams, Me.; James L. Olsen, Edgewood Arsenal, Md.; Hugh J. Ryan, Plattsburg Barracks, N. Y.; Clyde W. Scogin, Fitzsimons General Hospital, Denver, Colo.; Boyd L. Smith, Camp Eustis, Va.; Ernest F. Sharp, Fort McPherson, Ga.; William C. Webb, Jr., Fort Sam Houston, Tex.; James J. Weeks, Fort Snelling,

Minn.—*Army and Navy Register,* July 29, 1922.

Captain Joseph E. Eden relieved from treatment at Walter Reed General Hospital, D. C.—*Army and Navy Register,* August 12, 1922.

List of applicants who have accepted appointments in the Dental Reserve Corps: First Lieutenant E. E. Musgrave, Ash Grove, Mo.; First Lieutenant P. V. Clay, Binghamton, N. Y.; First Lieutenant M. R. Carey, Missouri Valley, Iowa; First Lieutenant M. J. Quinlan, Gilman City, Mo.; First Lieutenant W. R. Hatfield, Brooklyn, N. Y.; Captain W. F. Jackson, New Castle, Pa.; First Lieutenant J. A. Moran, Philadelphia, Pa.; First Lieutenant B. L. Wallace, Marion, Ohio; Major H. W. Wilson, Denver, Colo.; Captain W. O. Semans, Delaware, Ohio; First Lieutenant H. L. Bunker, Harveyville, Kansas; First Lieutenant G. B. Salisbury, Minneapolis, Minn.; First Lieutenant H. N. Scheibe, Rochester, N. Y.; First Lieutenant G. E. Thrun, Lansing, Mich.; Major B. E. East, Detroit, Mich.; First Lieutenant C. E. Geister, Okmulgee, Okla.; First Lieutenant P. E. Handler, West New York, N. J.; First Lieutenant W. A. Henke, St. Louis, Mo.; First Lieutenant James Neylon, Brooklyn, N. Y.; First Lieutenant J. G. Crutchfield, Ashboro, N. C.